Increasing resilience to storm-surge flooding: risks, trust and social networks

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Prelude

At the age of eight, as I recall, I was standing, on a fine sunny day, beside the back door of my home, when my attention was drawn aloft. As I gazed upward, and for the next 10-20-30 minutes, all I could see, all I could marvel at, were the clouds. For, as I watched, what started as an azure-blue Cornish sky, turned during those minutes, first to white, then to grey and then to a brooding and tempestuous black. I watched the storm gather, as the clouds blossomed, then tumbled and then crashed together, at a spot in the heavens directly over my head.

> *And then it rained and it rained and for the next hour I hopped and I skipped, I ran and I shouted and I was soaked by my very first flood*

At the age of eighteen, as I recall, I was working on a farm in Somerset. One morning in July, over to the east, the sky was black and I heard Brian shout, "**We've got 20 minutes!**" The river that fronted the farm was out of my sight then, set deep within its banks, but as we sped (me, completely bemused) to chase calves from their stalls, to shoosh chickens from their sheds, to lift chairs from the flags… that river rose

> *And it rose and it rose, and it spread and it roared, and I coaxed and I waded and I worked and I was soaked…again*

At the age of thirty, as I recall – I could check my old pocket book if precision were required? – the radio operator sent me to Polperro. As I drove, the rain formed a wall, or a blanket, through which driving was…tough. To speed was folly; the road was river but the village, the village was worse. The cars wedged; the curtains, brown; the gardens, flat, and the people… shocked

> *And when it was over, and after I'd watched and after I'd waded and after I'd worked and after, I'd dried… that flood remained, like the others, in my mind*

Hugh Deeming
4th September 2008

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Abstract

The overall aim of this research was to investigate relationships between risk perception and community resilience to low-probability sea-flood hazards. Importantly, the policy context within which the project was conducted was one of transition. A historical flood-defence paradigm was being replaced by one of flood-risk management; this shift being predicated upon inclusivity and a wish to empower individuals to acknowledge and mitigate their own flood risks. However, existing indices had identified disproportionate levels of social flood vulnerability within communities exposed to extreme sea-flood hazards. Therefore, it was important to investigate how such populations were engaging (or not) with this policy shift.

Three case-study sites, Mablethorpe, Cleveleys and Morecambe (UK), were chosen for more detailed research in a mixed–method investigation. Initially, a survey was used to quantify the populations' risk perceptions and flood resilience, by examining levels of hazard awareness and preparedness. Having quantified these phenomena in breadth, focus-groups were used to add interpretative depth to the investigation. Using social capital theory, it was possible to identify elements of the concept within these populations. However, it was found that the informal social networks that are constructed with this capital have little influence in building community resilience to flood hazards. Rather, they operate to maintain existing perceptions of risk and responsibility, with resilience appearing to be more directly related to personal hazard experience.

Introducing climate change as a risk factor revealed important differences in the way future flood hazards are perceived. That sea flooding is regarded as 'natural' and surface-water flooding as being due to human mismanagement, introduces an important twin perspective on risk and how it should be discussed. The role of trust in authority was also identified as fundamental within the social construction of flood risk, with the legacy of floodplain development revealed as a principal factor in explaining the low levels of risk engagement.

Recommendations are made in relation to how risk management and communication practice might be improved in light of these findings. It is also recommended that effort should be focused upon making planning policy and decision-making processes more transparent, in order to draw coastal communities into open dialogue. To be effective in promoting resilience, such dialogue must both acknowledge hazard exposure and honestly address the challenges and trade-offs that this exposure adds to already complex considerations surrounding community sustainability.

Acknowledgements

This thesis represents a culmination of the seven years that I have spent at university. The initial learning and then the research and writing process that has fuelled its production, has been an adventure, a roller-coaster ride that I could never have envisaged. Along the way I have received invaluable support and assistance from countless people, many of whom I am now proud to regard as my friends. This is my opportunity to thank them.

Primarily I wish to thank my supervisors, Gordon Walker, Fiona Tweed and Nigel Watson, for their help and guidance and for their ceaseless encouragement to "*just keep going".* Fiona, where would I have been without the 'pedant's pencil' and your logical brain?

Gordon I wish to thank particularly. Not only for his purchase of a very important ice-cream, but for providing a mixed blessing. The funding and the travel and publication opportunities, which constituted my involvement with the EU ARMONIA and SCENARIO projects, were invaluable, regardless of whatever I said to the contrary.

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To Harvey, how could I have done it without knowing that twice everyday you'd be ensuring I had my quota of fresh air and exercise?

Importantly, I wish to thank the residents of Mablethorpe, Cleveleys and Morecambe, for their time and for their willingness to entertain the requests of a fledgling academic.

Finally, to my parents, you have my love!

Hugh

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List of Acronyms and Abbreviations

AEP	Annual Exceedance Probability
CAPI	Computer-Assisted Personal Interview
CCA	Civil Contingencies Act 2004
EA	Environment Agency
FFWRS	Flood Forecast, Warning and Response System
FRA	Flood Risk Assessment
FRM	Flood Risk Management
IEM	Integrated Emergency Management
IPCC	Intergovernmental Panel on Climate Change
LPA	Local Planning Authority
LRF	Local Resilience Forum
PCT	Primary Care Trust
PPS25	Planning Policy Statement 25 (Development and Flood Risk)
QDA	Qualitative Data Analysis
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SOA	Super Output Area (Census)
UN/ISDR	United Nations International Strategy for Disaster Reduction

1 Introduction

Floods that affect human settlements and populations have occurred throughout history (Doe, 2006; Fagan, 2000) and over past centuries a wish to mitigate such hazards has resulted in considerable investment in structural flood defences. However, such measures are increasingly being found to lack efficacy in reducing flood consequences (White *et al.*, 2001). Flooding events that have occurred across the UK in recent decades have resulted in record levels of damage and disruption, as well as ongoing health effects in the affected populations (Bye & Horner, 1998; E.A., 2001; E.A., 2005c; E.A., 2005a; Pitt, 2007; Tapsell & Tunstall, 2008). As a result, the seeming inevitability of flooding has resulted in a reorientation of Flood Risk Management (FRM) policy, away from structural defence and toward living with the hazard. In effect, responsibility for risk reduction is no longer seen as being solely the burden of government institutions, but as something that needs to be shared by all members of society (Defra, 2005).

Unfortunately, despite any reorientation of FRM policy, flood hazards in the UK are not set to reduce as a public concern. The projections being made in relation to future climate change suggest that flooding events are actually likely to increase due to changes in precipitation trends, storminess and sea-level rise (Alcamo *et al*., 2007). Whilst precipitation changes are set to increase the risk of fluvial and pluvial flooding it is, however, the issues of storminess and sea-level rise which are of particular relevance to this thesis (Hulme *et al.*, 2002; Pfeffer *et al.*, 2008; Rahmstorf, 2007).

The East Coast Flood of 1953 (Baxter, 2005) and the inundation of Towyn, North Wales, in 1990 (Roberts, 1994), clearly illustrated that coastal flooding has the potential to cause severe damage to property and risk to life. Yet, around the coastline of England alone ~2.03 million people live within the Environment Agency's 'Flood Zone 3' (Walker *et al.*,

2006), which is a cartographic delineation of areas assessed to be exposed to a 0.5% (1:200) probability of sea-flooding in any one year (E.A., 2005b). Along many stretches of this coastline, sea defences are not capable of protecting to this Annual Exceedance Probability (AEP) (ABI, 2006; Crichton, 2005). Additionally, there is always the risk of a lower probability event occurring, whose residual effects would have the capacity to overtop or breach defences (Muir Wood & Bateman, 2005; RMS, 2003). This coastal population can, therefore, be regarded as being exposed to extreme sea-flood hazards. In addition to this aspect of exposure, however, within this population there are disproportionate numbers of people who suffer from multiple deprivation and who could, accordingly, be regarded as being particularly vulnerable to flood effects (Tapsell *et al.*, 2002; Walker *et al.*, 2006). Considering all these factors, it is hardly surprising that the risks associated with a severe storm-surge flood along England's east-coast, have been assessed as representing the potential for civil emergency that is only surpassed by the risks of pandemic flu (Cabinet Office, 2008).

Hazard exposure and vulnerability are not, however, understood as concepts by everyone in the same way. For example, quantitative risk assessment procedures are used by 'experts' to produce knowledge about the probability of whether a flood will occur, and to give some estimate of potential consequences (e.g. MAFF, 2000a). On the other hand, for their assessment of the magnitude of risk, 'the publics' rely more predominantly upon more subjective risk perceptions (Krimsky & Golding, 1992; Wynne, 1991). There is, therefore, much scope for the 'objective' and the 'subjective' to not align (Chapter 2) and this can result in the reinterpretation of even those formal risk communications that are based upon the 'expert' assessment of 'real risks'. Such reinterpretation can be particularly pervasive in relation to low-probability hazards; even if their predicted consequences might be high (Shaw *et al.*, 2005).

Despite this, it has been suggested that 'lay' understandings of risk should not simply be dismissed or considered as incorrect or inappropriate. They are often merely the result of pragmatic prioritisations made in the face of numerous, and often conflicting interests:

> "There are many problems in life about which people are worried … Being potentially affected by a (major) flood **is just one such worry among others**. What is more, in comparison with threats like diseases, the loss of a close relative, financial misery, unemployment and the like, from the perspective of the people at risk, flooding is not always the most important one. Quite naturally, with a growing time-interval to the last major event, flood hazards take a back seat. Thus, people don't think about rising waters all the time. What is more, one cannot live (or would not want to live) in constant worry." (Steinführer *et al.*, 2007: p.7, emphasis in original)

Whilst understandable, such prioritisations can be made without due regard for the fact that floods can bear significantly greater outcome risks than the other issues being deliberated in floodplain dwellers' cognitive equations (Sarewitz *et al.*, 2003).

However, the reinterpretation of formally communicated risk messages that occurs within informal social networks can also increase hazard awareness, preparedness and resilience, through the creation of disaster sub-cultures (Granot, 1996; Parker & Handmer, 1998; Wenger & Weller, 1973). Such social processes would appear to be an important resource that could be utilised more widely in the promotion of community risk engagement (Pelling & High, 2005) (Section 3.4). Despite this, research to-date has tended to concentrate upon studying populations and their social networks during the resistance / coping and recovery phases of the disaster cycle (Dynes, 2005). There has been scant investigation into exactly how these informal networks operate during the often extended periods of quiescence, which can occur between extreme hazard events. This is the period that Steinführer *et al.* (2007) refer to as 'Phase 1' of a flood event and encompasses the risk communication, participation and anticipation before an event occurs (Figure 1.1).

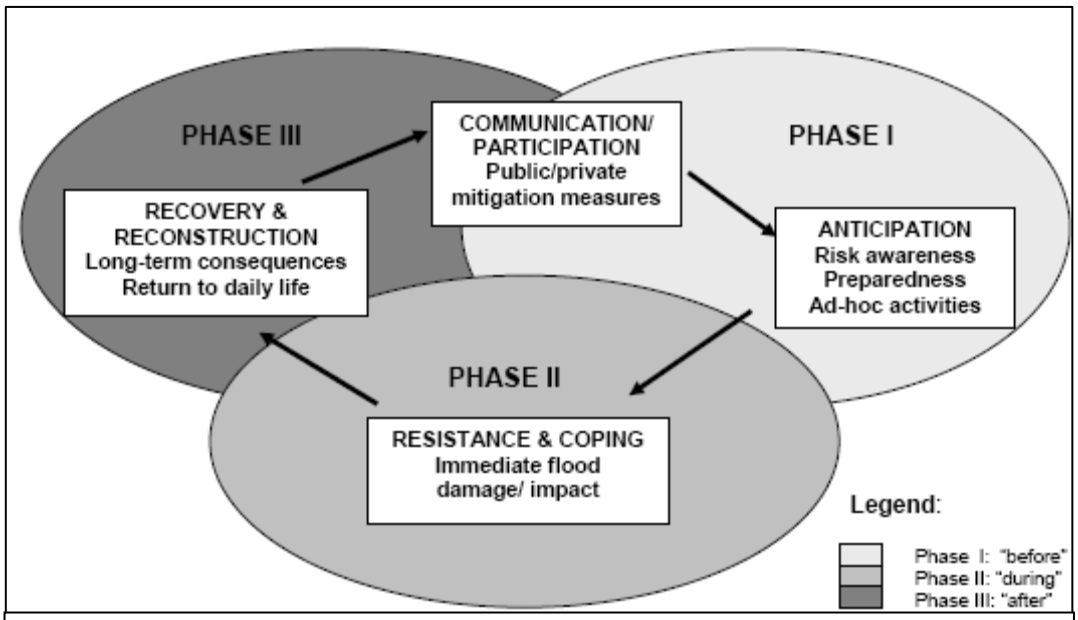


Figure 1.1: The phases of a flood event. This thesis concentrates on the activities conducted by individuals and exposed communities during Phase 1. Source: Steinführer *et al.* (2007: p.2)

Set against this backdrop, this chapter will briefly review and evaluate past research into the social aspects of flood-hazard resilience and identify the limitations in that research. Important concepts are then defined from the disasters literature, which allows the project to be contextualised against contemporary FRM policy approaches. The research approach taken within the project will then be introduced and its specific aim and objectives explained. Finally the structure of the thesis is summarised. This is done by way of a traditional 'wineglass' flow-chart, which illustrates the logical and cumulative research process that has been followed to produce the final work.

1.1 The Research Basis

1.1.1 Flood hazard research from the social perspective

Starting over fifty years ago there has been considerable research in relation to flood-hazard management, preparedness and response (Hewitt & Burton, 1971; Kates, 1962;

White, 1945). The early studies, mostly carried out in the US, were the first to identify the 'hazardousness of place' and the importance of having a suite of responses other than just structural measures with which communities could reduce their vulnerability to hazards. In effect, these studies served as a bellwether in informing the more recent policy shift, away from hazard reduction, toward more sustainable FRM (Mileti, 1999). More recent work has moved away from the concentration on **place** through to the investigation of the contextual, perceptual and social influences that can affect how risk information and communications are experienced, personalised and acted upon (Drabek, 2000; Mileti *et al.*, 2004). As an example, unlike some other environmental hazards, flood hazard exposure has been found to be not necessarily 'democratic'; with recent research suggesting that it can in fact be 'hierarchic' (to paraphrase Beck, 1992: p.36) i.e. certain sectors of the population can be more exposed and vulnerable than others. In the UK, research investigating the nature of flood vulnerability has revealed differing patterns in the way some particularly vulnerable populations bear the strain of hazard consequences; either in actuality or in potential (Tapsell *et al.*, 2002; Thrush *et al.*, 2005b; Walker *et al.*, 2006; Werritty *et al.*, 2007). Most importantly Walker *et al.* (2006), using the highest spatial resolution achievable with census-derived data, found that concentrations of people indicated as suffering from multiple deprivation were disproportionately represented within the population living within the English 0.5% AEP coastal flood zone.

In relation to community resilience and adaptive capacity, research carried out, both in the UK and around the world, has identified the importance of enhancing institutions and participatory governance in managing the risks associated with living on a dynamic coastline (Adger *et al.*, 2005; Few *et al.*, 2007; O'Riordan *et al.*, 2006; Tompkins, 2005). From a household perspective, the importance of enhancing the publics' perceived self-efficacy in reducing their own flood vulnerability has also been identified as an important

risk-reduction factor (e.g. Grothmann & Reusswig, 2006; Steinführer *et al.*, 2007). For example, suggestions have been made that formal risk communications which emphasise specific information about affordable or no-cost response measures that can be implemented at household scale can be particularly effective (Harries & Borrows, 2007).

Whilst all these findings are undoubtedly useful to flood-risk managers, there are limitations inherent within them. These limitations relate to the methodological and epistemological issues surrounding the collection and analysis of the data. Also, research that has scoped certain populations and hazards is not necessarily generalisable or transferable to different populations and hazards. These limitations will now be discussed in some detail.

1.1.2 The limitations of flood risk research to date

Several issues are relevant in identifying the limitations of prior research into risk perceptions and responses to flooding, particularly in relation to low-probability flood hazards.

I. In the UK, much of the recent research carried out to investigate social flood vulnerability has involved GIS analysis. Whilst such analyses are useful for identifying vulnerability, through the use of taxonomic indicators (e.g. limiting illness and age), they are not so capable of teasing out indicators of resilience (e.g. strong social networks) (Wisner, 2001). Macro-scale analyses of census data also homogenise significant populations into specific categories of vulnerability/deprivation, without the capacity to differentiate population variables at any finer resolution. This factor is particularly problematic when population sub-divisions include percentages of exposed and unexposed households (e.g. when a

flood zone intersects a census ward: an issue raised by Walker *et al.*, 2003; and Thrush *et al.*, 2005b).

II. Overall, quantitative data can be useful in building comparative visions of a population's general vulnerability, which may be useful for directing particular resources toward particular areas during an emergency e.g. public transport to populations with limited access to private vehicles. However, vulnerability has been identified as being temporally and spatially dynamic and, whilst it can be broadly categorised, an individual's or a social network's vulnerability to any hazard needs to be regarded as being specific to the local scale (Twigger-Ross & Scrase, 2006). Whether this complexity is manifested within any particular patterns across populations exposed to low-probability sea flooding has not been investigated.

III. Frequency distributions and correlations say little about underlying values and norms. Such quantitative analyses cannot differentiate the complexity of overlapping risk perceptions inherent within individuals and across exposed communities (Vogt *et al.*, 2008). Neither can they identify the relationships between these perceptions and the factor/s that initiate self-protective behaviour in the face of a hazard (i.e. rather than simply identifying that such behaviour has been exemplified). This needs more qualitative interpretation; and whilst some work has been done using qualitative methods (Burningham *et al.*, 2008; Fielding *et al.*, 2007; Harries & Borrows, 2007; Thrush *et al.*, 2005a; Tapsell & Tunstall, 2008) there has been a bias toward affected rather than at-risk populations, and fluvial rather than sea-flood hazards.

IV. It has also been suggested that the methods used in some previous quantitative research have led to an inevitable potential for bias in any conclusions drawn from

the data. In particular, the use of 'closed' questions within surveys may facilitate rapid data analysis, but the practice has been criticised. It has been pointed out that participants can provide their answers, not because that answer is the most well-considered, but simply because it was the most 'obvious' answer on the list of responses given to them in the form of a prompt (Fielding *et al.*, 2007).

V. Within the qualitative analyses undertaken to-date, there has been a paucity of investigation into how risk perceptions and responses are mediated, relatively, by experience and by the trust relationships individuals hold (a) within their informal social networks, and (b) with more formal risk-communication actors and information channels (Scherer & Cho, 2003).

VI. Whilst the importance of social capital (i.e. the norms of trust and reciprocity that facilitate collective action, which are explained in Chapter 3) has been identified in the building of community resilience (Adger, 2003; Pelling, 2003b), research in the UK regarding the relationship between social capital and flood-resilience building has been specifically identified as a research gap (Walker *et al.*, 2006).

VII. Previous research has revealed that 'therapeutic community' effects operate very effectively during the flood response and recovery phases (Dynes, 2006; Rodriguez *et al.*, 2006; Pitt, 2008). However, there is little empirical evidence to inform understandings of how exposed place-communities communicate, personalise and engage with risk during the quiescent periods between extreme events.

The current state of knowledge and the knowledge gaps relating to community resilience to flooding have now been identified. Therefore, the chapter will move on to explain the

research approach that will be taken in this thesis and how this approach will reduce some of the gaps in research-derived knowledge.

1.2 The Research Approach

This project seeks to complement existing research findings, by specifically investigating how people residing within places exposed to the extant low-probability threat of sea flooding perceive and engage with the associated risks and how they moderate these perceptions and knowledges through their informal social networks. Initially the research will identify suitable communities for investigation. In effect, selected populations will have been categorised as similarly exposed and 'vulnerable' to flooding through the quantitative methods of other researchers (Tapsell *et al.*, 2002; Walker *et al.*, 2006). Selecting these populations, will allow for more intensive research to investigate whether these quantifiably similar place-communities are in fact equally vulnerable when viewed from a more subjective and grounded perspective. This more refined research will be undertaken through the exploration of risk as a social construction (Krimsky & Golding, 1992), wherein risk perceptions (i.e. the combination of the individual's percepts of a hazard's probability, of its potential consequences and of their self-efficacy in coping with these factors), are not seen as simple, easily categorised attributes, but as variables that must be thought of as an amalgam of cognitive and contextual factors, which in turn are influenced by the perceiver's reflexivity. From this perspective risk percepts are conditional upon both an individual's negotiation through a 'tangle' of affective concerns, knowledges and understandings (Horlick-Jones *et al.*, 2003) and also on the social-institutional basis upon which certain risks are defined, either by them or for them by others (Rayner, 1992; Wynne, 1992). In effect, flooding is recognised as only one of many 'risks' within the social and cultural environment in which a person is situated.

The research is also informed by the earlier cognitive theory of risk introduced by Tversky and Kahneman (1974). The psychometric paradigm associated with this body of work emerged through early attempts to explain, through quantification, what had up until then been regarded as 'lay' irrationality in risk judgement. The individualist and 'laboratory style' methods used by these researchers created what is now the mature field of **heuristics** (Section 2.1.3). However, psychometric methods have been criticised, because they tend to regard risk as a purely cognitive construction:

> "The perceived risk is the outcome measurement (revealed or expressed preference) of the interaction of an individual and the external environment mediated through cognitive structure. The theory is ahistorical and non-contextual…" (Krimsky & Golding, 1992: p.18)

Despite these limitations, the judgement heuristics, such as 'availability' and 'representativeness', which have been introduced by this field, have undoubtedly increased aspects of understanding as to why risk is perceived differently within the population generally, but also across the expert / lay divide (*ibid.*).

From an 'expert' perspective, flood risk can be regarded objectively by any organisation or within any institutional framework that has been geared to assess the respective economic costs of diverse management options. However, this project seeks to investigate the socialisation and localisation of risk factors as they are expressed in the risk perceptions, and in the dialogue and adaptive behaviour of the sample populations. The research investigates how these perceptions account for the trustworthiness of actors and the institutions engaged in current FRM policies, which have been implemented on these peoples' behalf, and how they are influencing 'resilient' flood risk responses within the place-communities. This concentration on perception indicates a constructivist approach, but the fact remains that, despite what individuals may believe to the contrary (Slovic *et al.*, 2001), flood hazards are presenting an increasingly 'real' risk of serious consequences for

exposed populations (see Section 1.4.1.2). It is for this reason that a critical-realist perspective will be adopted for this analysis (Hoggart *et al.*, 2002; Sayer, 2000).

Informed by the work of Bhaskar (1975), critical realist philosophy is predicated upon an understanding that knowledge exists in two dimensions. From this perspective, those *objects* that are studied (e.g. physical processes, like flooding, or social phenomena, like community groups), form the intransitive dimension of science. In effect, these objects are not changed by the way in which people **think** about them. Conversely, the theories and discourse through which social scientists investigate these intransitive phenomena are themselves transitive. Sayer (2000: p.11) uses the example of the Earth to illustrate this contrast, by pointing out that just because the theory of a flat Earth shifted toward that of a round Earth did not in itself cause the Earth to change its shape. In the context of this project, it can, therefore, be seen that such an approach allows the empirical evidence as to the nature of flood hazards (e.g. the dire effects of the 1953 storm surge) to be used as a backdrop, against which the complexity of cognitive, individualist and socialised perceptions, values and norms can be projected.

Realist philosophy's acknowledgement of these two dimensions is, however, made more complex when these social phenomena are considered. Social phenomena are in a much greater state of flux than those in the physical world. This is because the social world is inherently socially constructed and, therefore, cannot be suggested to have evolved without the influence of at least some (transitive) knowledge. In effect, the knowledge upon which social phenomena are founded is understood to be highly context dependent. This means that social behaviour is understood to be "*rarely reducible to any combination of simple behaviours which are invariant across contexts*" (Sayer, 1992: p.234). It is here that the utility of critical realism is revealed over more constructivist approaches and its differentiation of phenomena, between the **real***,* the **actual** and the **empirical** becomes

important. In this trichotomy, the real describes whatever exists (be it a crystal or a bureaucracy), the actual refers to what happens if the power of the real is activated, and the empirical is defined as the domain of experience (i.e. what can be observed).

Real objects have the capacity to behave in certain ways and they have the susceptibility to certain kinds of change. Accordingly, research into the real is fundamental, because it investigates, both the function of the objects themselves and that of the structures of which they are part (e.g. gaining knowledge of the Environment Agency's flood-warning system as a real object, could be said to be contingent upon the need to first understand factors such as the Agency's use of technology, its specific operating protocols and its institutionalised linkages). An investigation of the real, therefore, concentrates on how the structure of (and between) objects influences not only what does happen, but the **mechanisms** behind these phenomena and what **could** happen given the nature of these objects and the mechanisms involved (Sayer, 2000).

In order to achieve an understanding of the real aspects of knowledge (rather than just the empirical), it is recommended that researchers employ both extensive and intensive methods. Supporting Clarke's (2001) guidance regarding the importance of using mixed methods in policy-orientated research, it is suggested that extensive methods are used to identify how extensive certain phenomena and patterns are within a population. This is because, from a realist perspective, important phenomena may be identifiable using nothing more than taxonomically-defined social groupings (e.g. older people may be quantifiably more risk averse than those in other age groups). However, whilst the discovery of these phenomena is interesting, extensive research has little **explanatory** value. It is only through the implementation of intensive methods that the causation of these phenomena can be postulated. Intensive research is, in effect, needed in order to identify "*what kind of universe of meaning exists in a particular situation*" (Sayer, 2000:

p.20). By employing this philosophy and these methods, this project will, therefore, be able to identify risk perception related phenomena within the sample population. Furthermore, it will then reveal the range of meanings that these individuals use to construct these phenomena; all whilst, importantly, acknowledging the presence of an extant physical hazard.

Within this realist framework and in response to calls within the literature for the investigation of the role of 'social capital' in pre-event hazard studies (Walker *et al.*, 2006), the project will use social capital as a lens, to explore both the sample 'communities' themselves and how any social capital inhered within them influences, either, the local risk factors, or those percepts of these populations that are associated with flood-hazard resilience. Various theories of social capital are discussed in detail in Chapter 3, but it is sufficient to note here that for the purposes of this project it is regarded as a property inhered within a population's "*norms and networks that enable people to act collectively*" (Woolcock & Narayan, 2000: p.226)

By acknowledging aspects of individualist psychometrics and socio-cultural influences, within a realist-inspired mixed methodology, this project will be a useful exercise in the critical cross-evaluation of quantitative with more qualitative methods of risk analysis. In effect, the extensive survey-derived data will allow the investigation of the "What?" questions of the research (e.g. Does flood experience influence flood risk perception?). The intensive focus-group discussions will then provide greater depth to the investigation of risk conceptualisation. Through grounding (Strauss & Corbin, 1998) the research within the initial and then the supplementary themes that arise from the focus-group analysis, the "Why?" questions will gain greater attention (e.g. Why do some people purchase insurance whilst others do not?). Specifically in this phase, research intensity will be achieved by challenging participants' individualistic interpretations of risk percepts through invoking the

influence of the other forum participants. Whilst each 'Other' is in many respects a peer, in that s/he too is exposed to the same flood hazard, s/he is also an individual who will have different life experiences and potentially conflicting interpretations of how 'the world' works. It is the negotiation within these fora, of what constitute risk factors and how risks should be managed, that will add a contextual richness to the analysis (Reed & Roskell-Payton, 1997). In line with the critical-realist reasoning described above, Mason (2006) agrees, that despite their epistemological differences, data derived from mixed methods can be analytically meshed. Further, she affirms that the dialogic interpretation that this allows has the capacity to challenge and expand any simplistic conclusions implied by the analysis of either dataset alone. Whilst such analyses might challenge the validity of purely deterministic risk-assessment procedures (e.g. Haynes *et al.*, 2008), they might also identify opportunities where FRM or warning policies can be realigned to capitalise on localised social or contextual resilience attributes (see discussions in Twigger-Ross *et al.*, 2008b or ; Steinführer *et al.*, 2007, relating to the importance of implementing flood warnings and FRM at a local scale).

1.3 The Research Aim

Having explained the general field of work to which this project will add and the mixed epistemological approach that will be followed, the specific research objectives can be introduced. The overall aim of the project is to investigate the relationship between risk perception and community resilience to low-probability coastal flood hazards. In order to achieve this aim a series of objectives need to be fulfilled.

1.3.1 The Research Objectives

Objective 1a: *To identify patterns of flood vulnerability within three exposed coastal populations*

Certain characteristics can make a household vulnerable to flooding and as a result these households tend to suffer more severe consequences when hazards occur (Cutter *et al.*, 2003; Morrow, 1999; Tapsell *et al.*, 2002). Through the use of indicators, this project will explore patterns of flood vulnerability within and between three coastal populations exposed to a low-probability sea flood hazard.

> **Objective 1b**: *To identify patterns of social capital (in the form of networks, norms and social trust), within the three coastal populations*

Through the quantification of social trust, reciprocity and institutions of social networking, this project will identify whether social capital can be said to exist within three coastal populations. These findings will provide a lens through which to investigate whether social capital theory is useful as a means to define a population's hazard resilience.

> **Objective 2a**: *To ascertain and describe the range of individuals' perceptions of, and responses to, coastal flood risk*

It is suggested that there is a diversity of social and environmental factors that influence the multiple perceptions of flood risk within any population (Fordham, 1998). Research in the UK has, however, concentrated on risks associated with fluvial hazards. This project will contrast risk perceptions within and between three populations that have been objectively defined as exposed and 'vulnerable' to a low-probability sea-flood hazard, in order to ascertain whether affective factors are equally diverse or whether they can be particularised to place or to community structure.

> **Objective 2b**: *To describe the range of influences that have stimulated, shaped and developed these perceptions and responses*

Risk perception theory suggests that the availability of information about particular hazards may influence risk perceptions. This project will identify the formal and the informal social percepts and environmental factors that are preferentially used by individuals to determine personal or social risks related to a low probability sea-flood hazard.

Objective 3: *To explore how social networks inform flood risk perception and preparedness in coastal communities*

It is posited that "*local champions*" are able to effectively normalise innovative behaviour within a public arena and, therefore, bring about culture change within a network or community (Rogers, 2003). In context, Shaw *et al.* (2005), suggest that in areas exposed to low-probability flood hazards, there is evidence that local champions, who autonomously implement effective risk-mitigation responses, can enhance greater resilience within a community. This project will investigate whether such individuals are identifiable within the case-study populations and whether there is evidence that their actions and activities are channelled into the wider population through any particular social networks.

Objective 4: *To assess the implications of the project findings for the building of flood resilience at a community level*

Evolving flood-risk management policy makes explicit the need for all communities exposed to flood hazards to share responsibility for the risks they live with (Section 1.5). This relates to low probability as well as high-probability hazards. This project will assess whether particular individuals or social networks within at-risk communities could be engaged within FRM projects in order to build flood resilience amongst the greater population. The implications of the project findings for FRM policy will be assessed.

1.4 The Research Context

The fundamental physical processes and effects of flooding in the UK have been observed and empirically recorded for centuries (e.g. Doe, 2006; Galloway & Potts, 2007; Haslett & Bryant, 2004) and in many respects the reality of the situation is that these processes and effects are understood (Knighton, 1998; Institute of Hydrology, 1999). As the geomorphologist Victor Baker has stated "*the outcome of flooding is exquisitely predictable*" (interview for: Frech, 2006). Accordingly, if the world were **ideal** then, *ceteris paribus,* as a society we would be capable of reducing our exposure to flood hazards to such an extent that severe consequences could be virtually eliminated. That this is self-evidently not the case indicates the inherent complexity of both historical and contemporary societies' relationships with flood hazards. It is the fact that all other things are **not** equal that has compelled an increasing requirement for society to make what White (1945) termed 'adjustments', in order that it can maintain or increase its occupation of areas exposed to either fluvial (*ibid.*) or coastal (Burton & Kates, 1964) flood hazards. It is in this context, of continued floodplain occupation, that this project is founded.

In setting this context, however, it is important to map out some key definitions in order that the reader can appreciate the complexities that are inherent in the consideration of flooding as a challenge to society. Once defined there will be a short discussion of how these various concepts relate to one another.

1.4.1 Some key terms and concepts defined

Throughout the literature certain words have often been used to describe ostensibly similar processes, or system characteristics, in different and sometimes contradictory ways (ARMONIA, 2006). Whilst this may not appear too much of a challenge, the fact that these terms may be used to describe, what are very important and multi-faceted concepts from

very different perspectives, can lead to confusion on the part of the reader. Therefore, it is important at this stage to define how some particular key terms and concepts should be understood, within the framework of this thesis.

1.4.1.1 Community / Network

Perhaps the most important definitions to introduce at this point are those of '**community**' and '**network**'. This is because the two are not necessarily synonymous and the word 'community', through both overuse and inexplicit use, has become a contested term (Delanty, 2003). For example, Delanty argues that the very essence of what makes 'a community' is inhered within the acts of **communication** that occur between its members. From this perspective a place-community cannot readily be identified as a community at all, because such interaction is unlikely to involve all those who reside within any geographically and spatially-defined **place**. Furthermore, it needs to be recognised that some individuals could belong to diverse communication-based communities, many of which are unlikely to terminate at any researcher-defined boundary. Other individuals may perceive themselves to belong to no community at all. The recognition of such complexity in defining how to engage with 'at-risk communities' in particular, has been identified in relation to emergency management (Buckle, 1998; Marsh, 2005; Wisner *et al.*, 2004). However, this complexity does not negate the fact that the geographical location of any particular group of people can mean that they are exposed to an empirically identified hazard, whereas, another ostensibly similarly aggregated group of people in a different place will not be so exposed. Accordingly, as this is a hazard-related project, a '**community**' is defined as being any population that is situated in a hazard prone area and which shares exposure to a particular hazard, but which may share little else. For such a community the important common elements are a risk, a need for mitigation services and, if a hazard-event occurs, assistance measures (after Buckle, 1998: p.23).

Specifically, for the sake of this project, communities comprise human populations that are spatially defined by the geographical location of their residential address within the 'sea flood zone' of the Environment Agency's Flood Map (E.A., 2007). In effect, such communities exist in places that have been calculated as being exposed to a high probability of flooding, but that are publicly identified as such by nothing more physically tangible than a line drawn on a map.

It is to be explicitly understood that such communities are not perceived as homogeneous, like-minded and demographically similar social aggregations. On the contrary, they are recognised as heterogeneous social mosaics, comprising individuals and groups that possess a diversity of demographic characteristics, as well as a range of potentially conflicting and competing social, political and cultural interests, norms and values (Marsh & Buckle, 2001). Despite this, Morris-Oswald (2005) suggests that shared values and norms can exist across social scales and that this factor can be important in the development of common goals. From this perspective, therefore, a place-community needs to be regarded more as a '**community of communities**' (Gilchrist, 2003).

Whilst problematic from a sociological viewpoint, such clustering is particularly important from a hazards perspective because, as Buckle (1998) points out:

> "By identifying a community with a geographic area we may be thereby creating a commonality of interest that can be used for emergency management purposes." (Buckle, 1998: p.22)

Defining community in such a way leads inescapably to the need to acknowledge the structure of the multi-scale social networks that will be present within this larger social aggregation. In effect the **networks** – that effectively make up the 'communities within the community' – must also be defined. Therefore, for the purpose of this project, a social

network should be considered as a collective of people that displays four principal characteristics:

1. Members interact on a somewhat regular basis and these relations have a certain stability
2. These interactions occur on several fronts
3. This interaction is not mediated by the state
4. Although these connections may not be strong, members to some degree share preferences or beliefs which go beyond any particular collective-action problem needing solution (Taylor and Singleton, 1993, cited in: Flora, 1998: p.7)

These social-system characteristics were originally intended to describe the concept of community (*ibid.*). However, as each characteristic is focused on some form of connection, rather than just place sharing, substitution in this context is regarded as appropriate.

Defined in such a way it can now be seen that, 'community' should be regarded as a term implying hazard exposure, whilst a 'network' is predicated upon social interaction. Networks can, therefore, be imagined to encompass a broad spectrum of collective social exchange, support and connection; from a family group to a dance class. It can also be imagined that a community (as defined) will inevitably contain diverse networks. These network connections may be strong or weak and they may operate in spatial confinement (e.g. within a household or street) or be dispersed over the wider community and beyond. It is the networks, along with the social norms that are imbued within them, that are fundamental to the production of social capital, which is a concept that will be discussed in detail in Chapter 3.

1.4.1.2 Hazard

A flood hazard is defined as "*a potentially damaging physical event that may cause the loss of life or injury, property damage, social and economic disruption or environmental*

degradation" (ARMONIA, 2006: p.6). An event such as an over-banking river, when viewed from this perspective, is not a hazard *per se*, it is merely a dynamic fluid process driven by gravity, which results from the exceedance of a geomorphologic constraint. A flood would be, however, labelled 'a hazard' by a population who may be affected by it, or to put it another way; who may suffer negative consequences from its occurrence (Burton *et al.*, 1993; Hewitt & Burton, 1971). This discussion reveals the importance of understanding that there are different types of flood hazard and that they can have different types of impacts. Here, therefore, is a sensible point to introduce a simple model that can be used to describe the different types of flood event: The 'Source–Pathway–Receptor–Consequence' (S-P-R-C) model (FLOODsite, 2007: Figure 1.2).

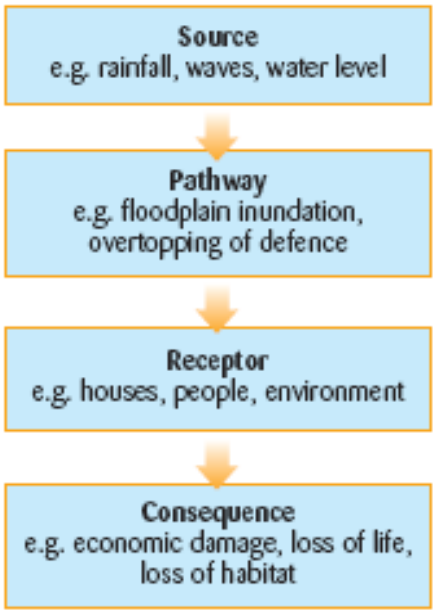


Figure 1.2: The simple conceptual S-P-R-C Model for representing the systems and processes that lead to flood consequences.
Source: FLOODsite (2007)

This thesis is predominantly concerned with sea flooding. However, by using the S-P-R-C model, one can see that flooding can emanate from different sources (e.g. rainfall or sea

waves), it can take different paths (e.g. by inundating floodplains or breaching sea walls), its effects can impact on different physical things (e.g. people or houses) and these effects can have different consequences (e.g. economic damage, loss of life or long-term health effects). In order to provide consistency with the UK literature, this thesis has utilised the S-P-R-C model as a framework to explore the various aspects of flooding, as they are perceived and experienced within the sample communities.

More philosophically, whilst flood losses were once perceived as being the consequence of a purely 'natural' hazard, there is now a mainstream understanding in the literature that this is not necessarily the case (Oliver-Smith & Hoffman, 1999; Pelling, 2003b; Wisner *et al.*, 2004). As defined, hazards are created by the interplay between an exposed society and the "*total*" environment within which they are situated, i.e. all of that environment's natural and modified components (Oliver-Smith & Hoffman, 1999). If hazards are to be understood in this way then it is necessary to take a holistic view of how they are created, more by a society's inability to adapt rapidly enough to dynamically changing social, physical and environmental conditions, than they are by a capricious 'nature'. It is because flood consequences can mostly be attributed to acts of human omission (i.e. either the things people fail to do, or the things they do without adequately considering environmental constraints: Burton *et al.*, 1993), that the author takes the position that flooding should be regarded as an environmental rather than a 'natural' hazard. Furthermore, although the climate-change effects that are projected to enhance future flood risks will be considered throughout the thesis, it is implicit that the sample communities are also subject to extant, residual risks. These are risks associated with the sample communities' exposure to flooding by extreme events, which are always capable of overwhelming existing protection measures (ABI, 2006; MAFF, 2000b; RMS, 2003).

1.4.1.2.1 Extreme events in a changing climate

From the perspective of the Intergovernmental Panel on Climate Change (IPCC), an extreme weather event is one, "*which is rare within its statistical reference distribution at a particular place*" (IPCC, 2007a: p.875). Whilst the term 'rare' could be regarded as a subjective measure of extremity, it is regarded for this thesis, in line with the IPCC, as an event which would fall within the 90th percentile of the normal distribution of event intensity **at that place**. In essence, the intensity of a storm-surge event might be considered extreme at one particular point on the coastline but not at another. As such, extreme events can be seen to occur within any normally distributed weather record as part of natural variability; regardless of the effects of anthropogenic climate change (O'Hare *et al.*, 2005). However, if climate change continues to gather momentum, as has been projected by the IPCC, then it is "*likely*" or "*very likely*" (IPCC, 2008: p.7), that extreme weather events will occur in the future, either with greater frequency, with greater intensity, or with both (Figure 1.3).

1.4.1.3 Exposure

Exposure is the degree to which a (natural or socio-economic) system or community is subject to an undesirable or injurious hazard event (NOAA, 2006). In this sense it could be suggested that the Environment Agency's 'Flood Map' (2007), should actually be regarded more appropriately as a flood-exposure map. This is because the Flood Map's layers delineate the amount of infrastructure and the number of business and residential buildings that are situated within flood zones. Therefore, the maps basically show the capital assets that are exposed to main-river and sea flooding events of particular intensities. Exposure is not, however, a good indicator of the severity of expected hazard consequences; the magnitude of these is more clearly associated with the vulnerability, and the resilience, of the exposed elements.

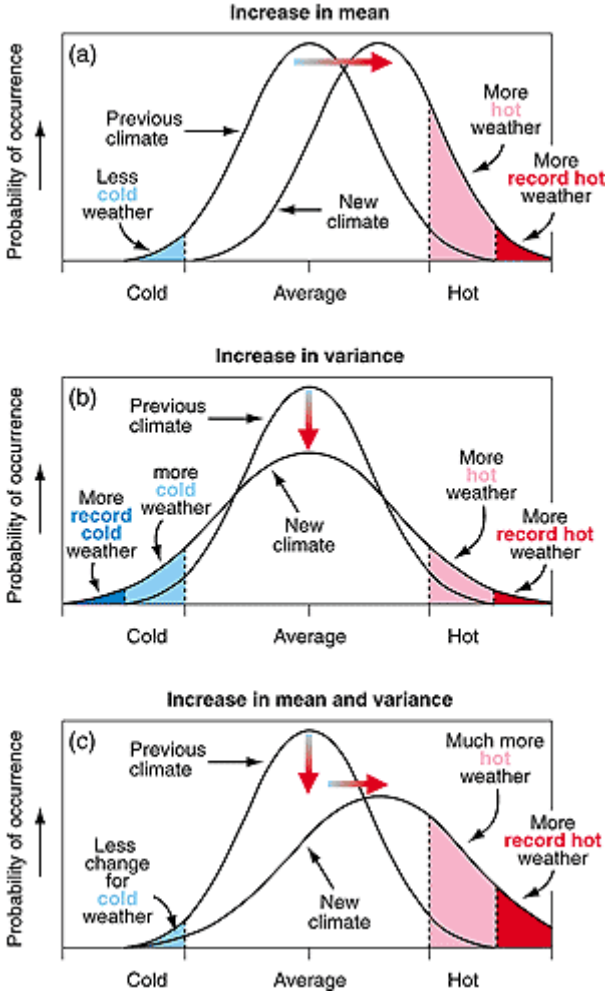


Figure 1.3: 'Climate' is a statistical construct created by averaging 'weather' over (usually) a 30 year period (IPCC, 2007a). Climate can, therefore be represented by a normal distribution curve of weather events. This curve indicates the mean, the variability and the extremes, which are realised by the curve's centre, its profile and its tails, respectively.
If climate change projections are correct then this distribution could be affected through the altering of the data mean (a) or its variance (b) or both (c). In whichever case there is a possibility of more extreme and record extreme events occurring.
Source: IPCC (2001: p.155)

1.4.1.4 Vulnerability

It is important to define the concept of vulnerability clearly here, in order that risk can also be defined. The term vulnerability can be used to define the condition of physical structures (i.e. 'physical vulnerability': Kelman, 2002) , or to describe the degree of strain revealed in institutions or infrastructure forced to operate under the stress of a hazard (i.e. 'systemic vulnerability': Alexander, 2000; Hellstrom, 2007). However, it is necessary for the definition of vulnerability employed in this thesis, to be directly relatable to the

characteristics of particular 'communities of place' (Pelling, 2003a). From this perspective it can be acknowledged that the most vulnerable **people** in society are often those with the least influence over formal stakeholders and decision makers and the least access to measures that could reduce their levels of risk. Therefore, the Wisner *et al*. definition of 'social vulnerability' as the "*characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard"* (Wisner *et al.*, 2004: p.11), is regarded as most appropriate[1]. Using the Wisner *et al.* definition allows the multi-dimensional, scale dependent and dynamic complexity of vulnerability (Vogel & O'Brien, 2004) to be investigated across populations. This is 'vulnerability' not only in relation to flood hazards but also, more fundamentally, in respect to other aspects of the (un)precarious nature of people's life-contexts that may contribute (or not) to their overall hazard susceptibility (Cannon *et al*., 2003).

1.4.1.5 Resilience

Whilst for some the concept of resilience can be simply defined as the opposite of vulnerability, it is important to make explicit that a resilient system is not just one which can cope with hazards, but rather, it is one that possesses an inherent capacity to adapt to changing conditions (Klein *et al.*, 2003). Resilience is a fundamental indicator of a system's adaptive capacity. Accordingly, the definition used in this thesis is that of the UN/ISDR who define it as "*the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to restore or maintain an acceptable level of functioning and structure*" (UN/ISDR, 2004). Implicit in this definition are two interesting aspects of resilience, in that the exposed 'system' can either exhibit

[1] This definition focuses the issue more closely on subjective interpretation than is recommended by Twigger-Ross and Scrase (2006) in their report to the Environment Agency on defining vulnerability for Flood Risk Management. However, its use encourages an *emic* dialogue, of what people actually believe it means to be 'vulnerable', to emerge from the data. This is a preferred approach to the use, solely, of an imposed *etic* account which would be informed simply by a broad parameterisation of (e.g.) demographic characteristics (Wisner, 2001).

reactive resilience, whereby the *status quo* is seen as the ideal state and hazards are resisted, or it can exhibit proactive resilience, whereby, the system organises itself in such a way as to adjust to new conditions, but without changing its basic operating state, or what ecologists would term, its 'domain of attraction' (Birkmann, 2006; Folke, 2006; Klein *et al.*, 2003). Both perspectives, however, require an element of reflexivity and the ability to learn, either from experience or – in human social systems – from information received (*ibid.*). In the context of climate-change enhanced flood effects, resilience could be regarded as a particularly important system property, because the effects of a changing climate are likely to manifest themselves to people, not as a gradual and perceivable long-term trend, but as a series of short-term shocks capable of severely testing the unprepared, the unadaptive and the maladaptive (Kelly & Adger, 2000).

1.4.1.6 Mitigation

The term mitigation in the climate change community refers solely to any activity that is designed, either to reduce the rate of anthropogenic emission of greenhouse gases (GHG) into the atmosphere, or to reduce the concentration of the GHGs within the atmosphere (IPCC, 2007b), i.e. in the sense of 'climate-change mitigation'. However, in the 'disasters community' it has a slightly different meaning. Within this community the term is used in its sense of describing more generalised 'disaster mitigation'. It describes any proactive strategy or intervention designed to minimise loss and facilitate recovery from environmental hazards or processes (Wisner *et al*., 2004). This thesis is focused specifically on building resilience to natural hazards so the word will be used in this, latter, context (unless otherwise stated) and as synonymical with the term adaptation.

1.4.1.7 Risk

Risk is an important concept for this investigation of social responses to low probability hazards. Accordingly, risk is here defined as being *"a combination of the probability of occurrence of a natural hazard and the extent of the consequences of the impacts. A risk is a function of the exposure and the perception of potential impacts as perceived by a community or system."* (ARMONIA, 2006: p.13). This definition is particularly appropriate for this thesis because it includes perception as being a means to identify potential consequences. For some, such a definition would be insufficient because it fails to apportion an explicit metric of loss (e.g. FLOODsite, 2005), i.e. there is not necessarily a financial **value** assigned to the consequences. The argument against using such a econometric approach is that hazard effects and impacts are not always tangible in an empirical sense (e.g. in their effects on health, Hajat *et al.*, 2003; Reacher *et al.*, 2004; Tapsell & Tunstall, 2008) and the concentration in this research is very much on how the broadest range of potential consequences are perceived by people purportedly **at risk** from coastal flooding. Risk is, therefore, regarded here in the sense of it being a social construction and as something that is dependent for its creation on all manner of factors, other than it simply being a financially auditable commodity (Tierney, 1999). Factors which influence the social construction of risk include the effects of particular societal power relationships, the nature of individuals' or groups' risk tolerance, and the voluntariness with which they engage in 'risky' activity (Messner & Meyer, 2005; Tierney, 1999: see Chapter 2 for a more detailed discussion).

1.4.2 Contextualising the definitions

The relationships between exposure, vulnerability and resilience to hazards have been much debated (e.g. Adger, 2000; Adger, 2006; Birkmann, 2006; Burton *et al.*, 1993; Hewitt, 1997; Pelling, 2003b; Wisner, 2001). In relation to flooding, these concepts have

been used to describe the changing macro- and micro-political processes that have guided the human development of floodplains. In 1945, for example, Gilbert White called for a critical examination of the assumptions being made in relation to how the implementation of 'adjustment measures' was being used to justify floodplain encroachment (White, 1945). Yet floodplain development has continued into the 21st Century; a phenomenon that remains accountable to the legacy of historical decisions, which initiated and then normalised such practice long before White wrote his thesis (Doe, 2006). This has occurred because the benefits of using this land have continued to be perceived to outweigh the costs, of either mitigating the most frequent hazards, or of suffering the consequences of the more infrequent extreme events; particularly as floodplains represent such a large proportion of productive and useable land (Kelman, 2003). The persistence of floodplain usage has, however, been accompanied by a concurrent supplementation and modernisation of the available 'adjustment' options. These now include any number of structural and non-structural measures that can be implemented with the aim of reducing either the hazard's effects or its consequences (French, 2001; ICE, 2001; ODPM, 2003).

This is not the only progress, however; the methodological perspective from which flood-risk reduction is viewed has also evolved. In the mid-twentieth century the emphasis fell heavily toward engineered solutions being the panacea. In recent years a more socio-centric perspective has emerged, wherein formal institutions at all scales now concede that hazards can not be prevented and that it is society that must adapt if the risk of human disaster is to be reduced (Borrows, 2006; Defra, 2005; EC, 2004; Mileti, 1999; Wisner *et al.*, 2004). The task of risk management is, therefore, now orientated toward the communication of risk information to the exposed, and working in partnership with them

and with the greater society, toward the building of resilience across scales; whilst accepting that this resilience **will** be tested.

However, whilst this transition has been important, it does not, completely, confront the issue of vulnerability. If those people who are vulnerable have no **access** to these resilience-building measures, or no understanding of them, then hazards will remain a pernicious challenge situated within their personal **landscapes of disaster**[2]. This makes it a challenge to which they are unlikely to respond and one for which they will almost certainly not prepare (Buckle *et al.*, 2003). The institutional orientation toward public engagement and participatory risk-reduction can fall short in this regard, because scales of power-relationships and rules can operate to frame processes and decisions which leave some populations more exposed to hazard effects than others (Johnson *et al.*, 2007; Brennan, 2007). As one example, the legacy of floodplain development means that many within these excluded populations will be particularly vulnerable to extreme hazards, due to a diversity of social and demographic characteristics e.g. because of age, gender or tenure (Burby *et al.*, 2003; Enarson & Morrow, 1998; Fordham & Ketteridge, 1995).

Yet, not everyone who could be taxonomically categorised as vulnerable actually is so (Wisner, 2001). The social context within which an individual, social network or community is situated, along with how this context influences their motivations and their perceptions of self-efficacy, can act to reduce the degree to which they are hazard affected (Grothmann & Reusswig, 2006). Thus, with the inclusion of community and social-network variables, vulnerability and resilience can be seen as dynamically changing and localised concepts. It is this 'socialised' context of flood vulnerability and resilience that is the focus of this

[2] A person's everyday life can involve a multitude of different challenges and priorities. If such is the case then actions to reduce extreme risks perceived as having little probability or immediacy can be neglected in favour of those which are perceived to moderate more routine pressures (e.g. paying the rent or feeding the children 'properly') (Hewitt, 1997). The Landscape of Disaster concept is figuratively illustrated in Chapter 3.

thesis. How do individuals and their informal social networks produce and manage their own resilience, within a politically encouraged context of self-determination, and in the face of the extant threat of an extreme environmental shock?

In effect, individuals, households and social networks perceive and can mitigate their own risks autonomously to a certain extent. However, the structure, transparency and participatory openness of FRM institutions, and the accent of the policies by which they are bound, can also be a rooting influence in determining the nature of, both a population's vulnerability and of its resilience (Wisner, 2001). It is for this reason that the discussion now moves on to describe the policy context in which this research takes place.

1.5 The Policy Context: 'Making Space for Water', the Civil Contingencies Act and the 'Resilience Agenda'

1.5.1 European Policy and the National 'Making Space for Water' Strategy

The increasing trends identified in flood losses suffered across Europe, particularly during the past decade, have resulted in legislative action being taken by the European Commission, toward regulating the manner in which flood risk is managed by the member states. For example, in October 2007 the Floods Directive (2007/60/EC) came into force. This legislation provides a high level framework under which member states are required to prepare FRM policies. Particular requirements of the Directive are, that Member States carry out flood-risk assessments and that by 2015 they produce publicly accessible hazard and risk maps. Whilst policy at this level is obviously concerned with strategic FRM oversight, rather than the operational aspects of managing flood incidents themselves, the Commission have also published guidance on best practice in flood prevention, protection and management (EC, 2004). This guidance includes specific reference to the need for the public to engage with the risks associated with living on the floodplain:

> "It is the **personal responsibility** of anyone who lives and works by or on the river, and broader in the potential flooded area, to adapt his use of the water and all activities to flood risks. So, every one must **know** the risk and take it into account appropriately when acting." (EC, 2004: p.16, emphasis added)

In the UK this particular aspect of the guidance has been transferred directly into the Defra's 'Making Space for Water' FRM strategy in the statement:

> "The public will be more aware of flood and coastal erosion risks and empowered to take **suitable action** themselves where **appropriate**." (Defra, 2005: p.14, emphasis added).

European policy on the participatory governance of flood risk has, therefore, been incorporated into the organisational framework of the UK FRM institutions. However, such generalised conditions must be regarded as being inherently problematic. For example, how does one define knowledge of a risk? How does one define '*suitable action',* or at what point the implementation of such action would be deemed as '*appropriate*'? These questions will be considered in Section 1.6.

1.5.2 The Civil Protection Context

Taking a Civil Protection perspective on FRM within the UK, the Civil Contingencies Act 2004 (CCA) lays out the statutory duties of responding agencies faced with 'an emergency' i.e.:

> "An event or situation which threatens serious damage to human welfare in a place in the UK, [or] the environment of a place in the UK …" (HMG, 2005: p.5).

The CCA, in effect, provides a framework under which local, regional and national agencies, organisations and private-sector stakeholders can plan for the contingencies of emergencies, which are scaleable, from those affecting villages to entire regions. Accordingly, the main focus of the CCA is in the coordination of response through Integrated Emergency Management (IEM), and the lowest tier at which IEM is exercised is

within the Local Resilience Forum (LRF)[3]. Whilst the statutory designation of responders and civil-protection responsibilities has been welcomed as a move toward more resilient society (Alexander, 2004; Medd & Marvin, 2005), it has also been suggested that the CCA, and LRFs particularly, are actually very exclusive, in that they are not designed to facilitate the participation of the wider community within risk-related deliberations:

> "[Resilience fora] focus strongly on partnership working rather than community engagement." (Twigger-Ross & Scrase, 2006: p.9)

From the perspective of participatory risk-governance, therefore, the CCA could be regarded as an instrument that perpetuates the 'deficit model' of risk communication, whereby, the LRF (i.e. a clique of local 'experts') defines what is 'best' for the 'lay' population. Accordingly the CCA, could be regarded as an instrument of public 'command and control' (Alexander, 2003). O'Brien (2005) further suggests that whilst the CCA represents a massive overhaul of emergency planning, which was previously something of the "*Cinderella of the local services*" (*ibid.*: p.358), there is little evidence that its arrival has been accompanied by concerted efforts to engage the public comprehensively into the 'resilience agenda' of which the Act is part (Cabinet Office, 2004). For example, there is no contingency within the Act for the integration of volunteer convergence or 'spontaneous volunteerism' into emergency plans (Walker & Broderick, 2006); despite the clear evidence that such individuals will be a major resource in any response effort (Dynes, 2005).

1.5.2.1 Local Implementation

Notwithstanding that the overarching IEM framework effectively excludes the public from these tiers of planning, responders categorised under the Act are explicitly required to undertake community-based resilience-building activities. For example, under the Act's

[3] An LRF is a collective of responders who meet regularly and during emergencies to coordinate and monitor risks and responsibilities at the scale of a police area.

auspices the Environment Agency has been designated as a Category 1 responder and as Lead Responder for warning the at-risk population during flood emergencies (HMG, 2005). In accord with this status, the Agency also bears overall responsibility for structural sea defence around the coastline (E.A., 2008b). From the non-structural perspective the Agency produces and supplies literature on flood-risk reduction to the public (E.A., 2008c). It is also responsible for operating the IT-based national flood warning system '*Flood Warnings Direct'* (FWD), the national '*Floodline*' advice service and for carrying out national and locally-based awareness campaigns (e.g. the "Community Flood Archive" Project in Chiswell, Hampshire: E.A., 2008a; see also Bonner, 2007).

In its current Corporate Strategy Plan the Environment Agency sets out a series of goals in relation to community engagement with flood risk. These include the targets of providing an appropriate flood warning service for 80% of the properties at risk on the floodplain and for the take up of the warning service to be increased amongst those in the most vulnerable groups (E.A., 2006: p.21). In addition to this 2009 service-delivery aim, the Agency also has a target of 75% for the number of people in receipt of a warning message to take "*appropriate*" action based on the Agency's advice (*ibid.*: p.23). Whilst these are important targets, there have been suggestions that their achievement will not be straightforward. For example, even within the Agency itself there is concern that a concentration on 'quantity' as regards service delivery is acting to hamper the 'quality' of the message and, therefore, the efficacy of the resultant public response to warnings (Twigger-Ross *et al.*, 2008a). From a long-term resilience perspective, there is also evidence to suggest that only 39% of previously flooded households and 6% of at-risk households, have taken any action to prepare for future flooding (Harries & Borrows, 2007). In his review of the summer floods of 2007, Pitt (2008. p.418) identified this shortfall in public engagement and urgently recommended that members of the public

residing on floodplains (1) prepare a flood emergency kit, and (2) increase their personal readiness and resilience by heeding the advice which has been collated and circulated by the Environment Agency.

It has now been shown that this project is being undertaken at a time of considerable political flux. New FRM policies are being implemented and new institutions defined. However, evidence suggests that the public is either being left out of these changes to some extent, or is being left behind by them. This is despite the fact that participation and the self-determination of risk are central to the policy changes. This chapter will close by summarising the important issues that have been identified and by signposting how the thesis will illuminate these issues from a new perspective in order to progress knowledge.

1.6 Summary

This chapter has introduced the environmental, social and political context in which this research project was framed. In setting the bounds of the research, the chapter has identified where there are gaps in the social science understanding of how flood risk is perceived and how it is experienced, within exposed place-communities. The relevance of these knowledge gaps has been explained, through the description of the current reorientation of flood risk management policy. The argument that structural solutions are no longer regarded as a universal response to all flood hazards has also been summarised, as have the potential challenges that this reorientation introduces.

Two aspects of flood hazards have been identified as having only attracted limited research attention from a social science perspective, i.e. sea flooding and low-probability, extreme events. Both these aspects epitomise extant threats, i.e. regardless of the condition of sea-defence structures, people live on coastal floodplains and are, therefore, exposed to the residual risk of low-probability flooding. Furthermore, climate-change

projections suggest that coastal-flood hazards may increase in intensity or frequency as a result of accelerating sea-level rise and increasing storminess. In effect, the strategies that individuals implement to deal with today's risks need not be sustainable into the future. Therefore, the importance of gaining an understanding of how these communities socially construct the risks these hazards present for them has been identified. This is because risk perceptions and risk responses are argued to directly affect the resilience of individuals and wider communities. From this perspective, community and social networks have been defined in respect to their being useful concepts through which a population's resilience might be investigated.

In light of these findings, the project's aim and the objectives to be achieved in order to progress toward it have been presented. To accomplish these objectives a mixed-method approach is deemed appropriate. Such an approach initially utilises quantitative survey data to establish a broad understanding of emergent concepts. These can be thought of as labels, which are used to describe recurrent phenomena that emerge from the data. For example, survey analysis might reveal that most residents of a town appear to believe that flooding is likely to occur: accordingly, 'perceptions of flood likelihood' would then become a concept open for further analysis. Once such concepts have been revealed, a more intensive, qualitative, analysis of focus group discussions can provide a depth to the research, by identifying the underlying dimensions of the broad concept. Using the same example, it might be revealed that some people think flooding is likely because they believe the sea-defences are too small, whilst others might blame a lack of drainage infrastructure. Therefore, it can be seen that in combination, these analyses identify concepts, but they also illuminate potential complexity that is capable of challenging singular interpretations: in this example, by revealing the risk perceptions that allow some

people to prepare for certain types of flooding, whilst other ostensibly similar individuals might prepare differently.

In order to progress the project it is now important to introduce a methodological framework through which the risk and social factors that influence community resilience can be drawn together, investigated and then described. Adopting such a research design allows the reader to understand the research stages and how each stage operates to finally deliver useful knowledge. The thesis is presented in nine chapters which are separated into the four sub-categories of: Rationale; Research; Results and Discussion; Implications and Conclusions. Utilising the traditional 'wineglass' model (Figure 1.4), it can be seen that the initial problem-setting requires a broad grounding in the state of current knowledge described in the literature. Therefore, in order to focus the research, Chapter 1 has set the context for the investigation and has introduced the project aim and objectives. Chapter 2 then reviews the literature in relation to risk and risk perception, concepts that form the basis of the investigation. There is a concentration within the thesis on exploring the role of community and social networks in the construction of resilience. Chapter 3, therefore, introduces the concept of social capital; the lens through which certain data will be analysed.

With the research question already identified, Chapter 4 then details the methods of data collection and the analyses that were employed to achieve this aim. The implementation of these methods required its own framework, which is also introduced in that chapter. In Chapter 5, the case-study sites and sample populations that were found to encompass the attributes in need of investigation are described. Then, with the data collected, Chapter 6 commences the analysis, by describing the sample populations from two perspectives. First, their vulnerability will be examined through the quantification of survey responses to items derived from the Social Flood Vulnerability Index (Tapsell *et al.*, 2002). Then, the

nature of the social capital present within the communities will be explored, by investigating the type of social activity undertaken by the sub-populations.

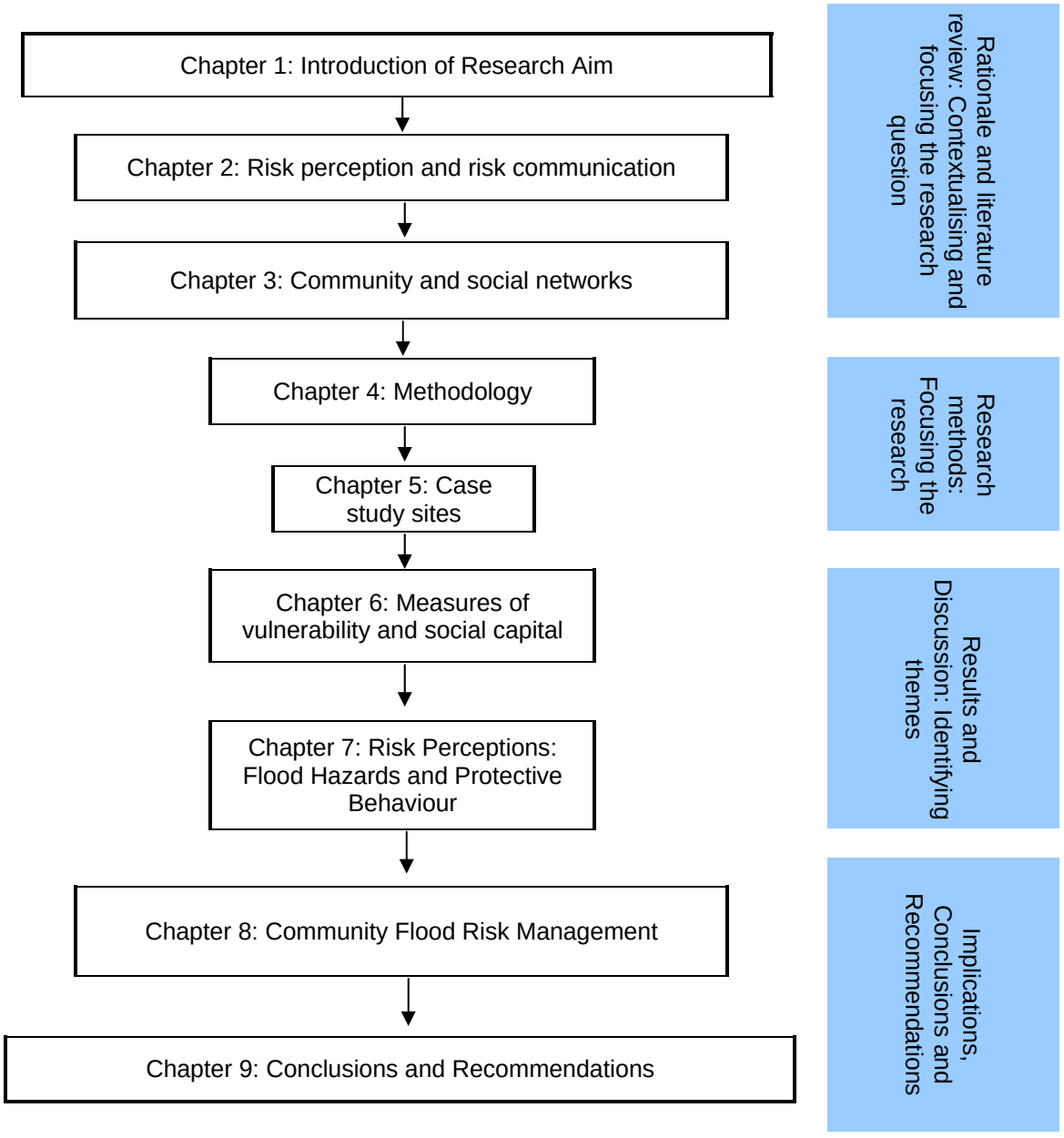


Figure 1.4: The Project's Research Design portrayed as a wineglass.

The respondents' propensities toward social trust and for entering into reciprocal arrangements – two elements of social capital – are also discussed. Chapter 7 takes the analysis forward into its qualitative phase, by investigating the range of flood-risk perceptions reported by the population, and the numerous influences that determine how these perceptions are socially constructed. Perceptions of risk will not be the only subject of investigation. The range and efficacy of the responsive actions that individuals anticipate that they could take in the event of a flood will also be discussed.

Following this, Chapter 8 continues the investigation of perceptions, but this time in relation to resilience building. Details of respondents' suggestions as to how their households and greater communities might be made more resilient to a future flood are explored. The 'resilience diffusion' role of 'Local Champions' is investigated here, again from a social capital perspective. Once these household, neighbourhood and community effects have been discussed the investigation refocuses. The public are in many respects reliant upon the FRM organisations, their institutions and the policies under which they operate, to mitigate the flood risks to which their communities are exposed. Therefore, Chapter 8 concludes with an exploration of the issues of trust and responsibility that inevitably bind exposed communities to these authorities and institutions.

In Chapter 9, concluding comments will discuss the thesis' contribution to scientific knowledge. Its implications in the context of FRM policy will be discussed and policy recommendations will be made. Finally, recommendations will also be made regarding further research, which it is suggested might clarify uncertainties, which result, either from the methods used in the project, or that were revealed within the findings.

2 Risk Perception and Risk Communication

2.1 Introduction

In Chapter 1 the project aim was introduced and justified. The research process being undertaken to meet this aim was also described. The discussion will now move onto discuss the issue of risk and the communication of risk information to the public. The chapter will initially reiterate how 'risk' should be defined in this thesis. Theories that have been developed in an attempt to quantify and explain risk perception will then be introduced. Informed by this review, the issue of risk communication will then be discussed. Finally, the limitations in our understanding of issues related to risk perception and risk communication will be drawn together and the role of this thesis in reducing these limitations will be explained.

2.2 Risk

As explained in Chapter 1.4, for the purposes of this thesis the concept of risk is defined as…

> "…a combination of the probability of occurrence of a natural hazard and the extent of the consequences of the impacts. A risk is a function of the exposure and the perception of potential impacts as perceived by a community or system." (ARMONIA, 2006: p.13).

This is a broad and inclusive definition that takes account of a wide range of social and cognitive effects, as well as those that are economically auditable. As such the definition expands on the popular equation that is frequently used in flood risk assessments:

> *Risk = Probability x Consequences* (FLOODsite, 2005)

A broader definition has been used because, it is argued here, that the management of flood risk in an exposed community should not solely be regarded as the preserve of the

scientists and professional flood-risk managers; even though their roles need to be explicitly considered (Faulkner *et al.*, 2007; McCarthy *et al.*, 2007). Rather, risk and flood-risk management in contemporary society is the responsibility of not just institutional actors and agencies, but also of the diversity of **publics** who are affected by many of the decisions that are made on their behalf (Buckle *et al.*, 2003; Grothmann & Reusswig, 2006; Harries & Borrows, 2007; Speller, 2005).

Risk management, in effect, has come to be regarded as an issue of participatory governance; even if actually engaging the public in such a process remains problematic (Steinführer *et al.*, 2007). Before discussing aspects of risk perception and risk communication as a participatory process, it is important to describe the nature of **risk** itself. Two principal forms of risk are relevant here; quantified risk and risk perception.

2.2.1 Quantified risk

Implying that popular definitions of risk are deficient, because they fail to encompass the more subjective aspects of risk perception, is not to say that the technical parameterisation of risk (i.e. the statistics-based model output used by 'experts' to quantify risk exposure) is not important when hazard mitigation is viewed from an engineering or flood-modelling perspective (Renn, 1992). In fact such quantifiable risk assessments are important because they…

> "…generally consider the probabilities associated with the occurrence of particular events as objective, knowable, and quantifiable, [and from this perspective] risk analysis is seen as a method for developing estimates that approximate reality. Many risk calculations, such as those associated with traffic- and fire-related deaths, are based on extensive actuarial records." (Tierney, 1999: p.219)

In calculating flood risk, assessments are normally carried out through the calculation of values such as Annualised Average Damage (AAD) (Lumbroso, 2006). For this the

economic damage anticipated to be caused by flood events of a series of different magnitudes is calculated. This allows the construction of a probability vs. economic damage curve that is sufficiently accurate to use within benefit : cost analyses (MAFF, 2000). Assessing risks from extreme floods from this statistics-based perspective has, undoubtedly, informed the construction of many flood-defence structures and the implementation of flood-risk reduction measures, which have been effective in reducing losses during the past century. However, these assessments have also failed dramatically (Mileti, 1999). Such failures, Tierney (1999) argues, occur simply because when an 'expert' enters a series of (sometimes synthetic) data into a decision-framework and gets an intelligible output, this output, when used as a risk assessment, may not actually represent what is **possible** in the real world at all. She terms the willingness of such people to rely on scant and limited datasets to legitimise their risk-analytic procedures as a 'spillover' effect. This effect is fuelled by the success of similar assessment procedures carried out within much more controlled and quantifiable environments. In this context, however, the term 'expert' is being used in its broadest sense, in that decision-makers as well as specialists are being considered in this category.

MacKenzie (1990) contends that certainty in relation to the use of scientific knowledge can be conceptualised as forming a trough shape, as the knowledge is produced and then utilised by agents progressively further away from this inception point. In effect, MacKenzie contests that knowledge producers[1] appreciate the usefulness of their model outputs but are also aware of the uncertainties and the caveats that must be applied to them. As the knowledge passes to '*program loyalists'* it is treated with much greater confidence before, finally, a resurgence of uncertainty can occur as the knowledge

[1] *NB*. In the context of this thesis this group could include flood modellers

passes to the '*alienated*'. Thus, the 'certainty trough' is formed (Figure 2.1). From this perspective it could be conjectured that the politically motivated decision-makers who are ultimately responsible for putting flood-risk management systems in place could be regarded as the 'program loyalists'. This is because it is this group who 'need' to have faith that they are acting upon the best available information and who would, therefore, be keen to take scientific knowledge at face value. Likewise, 'the community' could be regarded as the 'alienated' because it is they who may be aware of the localised effects and influences that challenge the applicability of any inherently constrained model; but it is also they who have little decision-making influence.

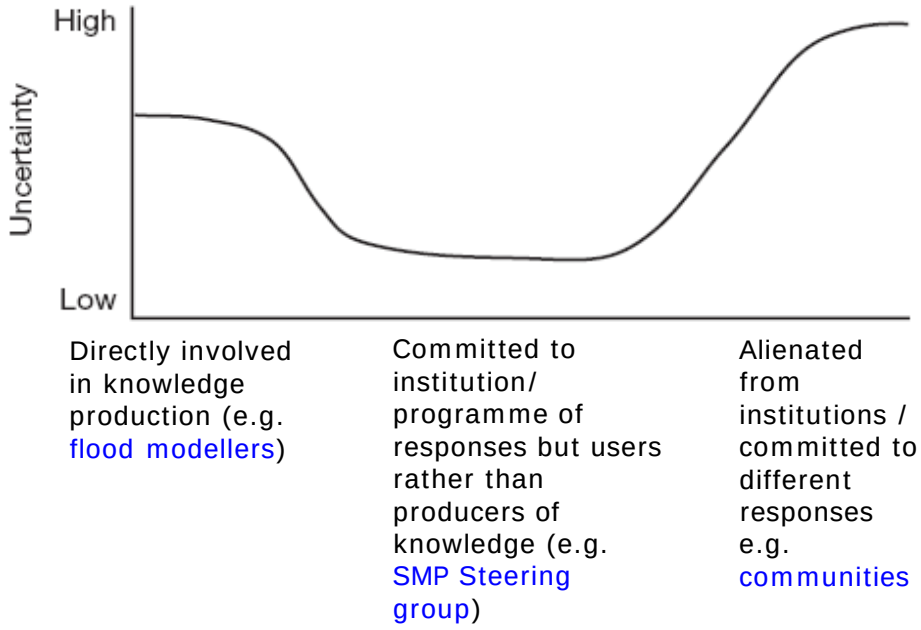


Figure 2.1: MacKenzie's certainty trough concept applied to flood-risk management
Source: MacKenzie (1990: p.372)

In an example that relates to hazards on a wider scale, Bernstein (1996: p.35) posits that "*data based in the past constitute a sequence of events rather than a set of independent observations that are required in the laws of probability*". In other words, environmental hazards are recognised as discrete dissimilar occurrences that are subject to specific

spatial, temporal and environmental conditions rather than a series of like, predictable, events.

Bernstein points out that the challenges in using probability theory to quantify risk from such hazards lies in the contrasting tasks of having to look into the future whilst interpreting the past and balancing opinions with what is known. From a climate change perspective, this insight is particularly apposite as, if the projections are correct, the dynamics of future weather are unlikely to comply with any 'future as a mirror of the past' model (van Aalst, 2006). It is for this reason that ensembles of climate models are now being used to project a range of potential coastal flood and erosion futures that, together, can be used to inform political decision-makers of the bounds of uncertainty[2] (Wilby, 2007).

Downton *et al.* (2005) speak of uncertainties in relation to flood-risk management and of the multiple, often-imbalanced, professional and political interests that prevail in keeping settlements in the flood zone economically viable. They suggest that it is basically impossible to find a 'best' estimate of risk that will satisfy the needs of all stakeholders in such a confused 'space'. Thus, the decisions made within relevant fora in relation to low-probability hazards, may represent a pragmatic approach on the part of certain stakeholders, rather than the most appropriate options for all. This last point brings out the point that there is an acknowledgement that 'objective' decisions made by 'experts' are often not constrained by pure, empirically-supported knowledge at all. In fact they are made under the influence of many of the same value-related and cognitive effects as those of 'lay' decision makers (Dodds, 2007; Horlick-Jones, 2005; Pappenberger *et al.*, 2007; Slovic, 1999). In many respects the 'lay' publics can actually be greater experts in

[2] In the UK, one set of such model outputs was produced explicitly as a suite of four in order that decision-makers could not simply pick the middle option because they assumed it represented the 'best estimate' (Wilby, *pers comm*).

understanding the nature of risk than those who are professionally employed to quantify it. For example, in reporting on their community-resilience focused research in Australia Buckle *et al.* (2003) found that:

> "Local people had an understanding of hazards to which they and their communities are exposed that was sophisticated and comprehensive. They understood better than agencies the range of hazards to which they [were] exposed and also the potential outcomes (risks) to which they were exposed when confronted by the hazard agents." (*ibid.*: p.84)

Quantified risk assessment will also be cast under suspicion if a community is afraid that any narrowly focused expert attention on a particular hazard might miss something held to be important by the community as a whole. Margolis (1996) posits that conflict is not caused by what the expert misses, it is more to do with what the lay person **feels** the expert should take into account and does not.

2.2.2 Risk Perception

It is the feelings that Margolis (*ibid.*) describes that are representative of the **subjective** characteristics of how risk is perceived rather than how it is objectively quantified. It is the factors that constitute risk perception that are particularly challenging to understand. This is because they can generate a **richer** perspective of risks and how they affect the different layers of society and the environment (Rayner, 2004). If integrated into a risk assessment process the acknowledgement of subjective risk factors can also lead to a more **honest and open** engagement of the community and the ability to arrive at a "reasonable" assessment of risks i.e. an assessment that accepts that some risks will fall within the categories of uncertain, unknown or unknowable (Sjöberg, 2001). However, many professional risk managers find it hard to concede that uncertainty bounds need to be acknowledged in public risk communications. Their fear is that in admitting the impossibility of deterministically quantifying every aspect of a hazard or risk, they may

cause public confusion that in turn might lead to the information being ignored (Faulkner *et al.*, 2007; Petts & Brooks, 2006). It needs to be stated, however, that assessing subjective risk perception and the '**social construction of risk'** (Bradbury, 1989; Krimsky & Golding, 1992), does not assume that a '**real**' possibility of harm does not exist for an actor within a 'hazardous' environment. For, as Johnson (1987) states in relation to risk communication:

> "To assume the social context is all, and there is no objective knowledge that should be communicated, is as blind as assuming that only technical data are salient." (*ibid.*: p.110)

Rather then, it can be understood that individuals and social groups **will** create their own boundaries and understandings of what 'risk' means to and for themselves (Clarke, 1999). There is an obvious corollary to this, i.e. if an actor's assessment of personal risk systematically ignores any, available, empirical evidence of hazard effects within a particular environment, then it is likely that s/he will be "predictably surprised" when a hazard does occur (Bazerman, 2006).

Whilst the richness and contextuality of risk perceptions can be presented in a positive light, it is also important to recognise that they can have negative effects in relation to community preparedness for low probability / high consequence hazards. Essentially …

> "… given the responsibilities and commitments of day-to-day life and such competing priorities as managing families and employment, it may well be the case that engagement in disaster management will rarely be given a high priority by local people. They may argue (in [Buckle *et al.*'s] view, with at least partial justification) that it is the role of government to protect its citizens. In any case, local capacity to commit a large amount of time and effort to unlikely events is not high." (Buckle *et al.*, 2003: p.87)

This correlates with other work that suggests a belief that risk perception may not even be about risk, but that it may be acting as a surrogate for other social or ideological concerns (Douglas & Wildavsky, 1982; cited in Slovic, 2001: p.231). It also accords with

the ‘landscape of disaster’ concept that was introduced in Chapter 1.4.2, in that people, particularly vulnerable people, can have so many other pressing issues in their daily lives that the ‘view’ they have of their exposure and vulnerability to low-probability hazards is obscured by the immediacy of these other concerns (Figure 2.2).

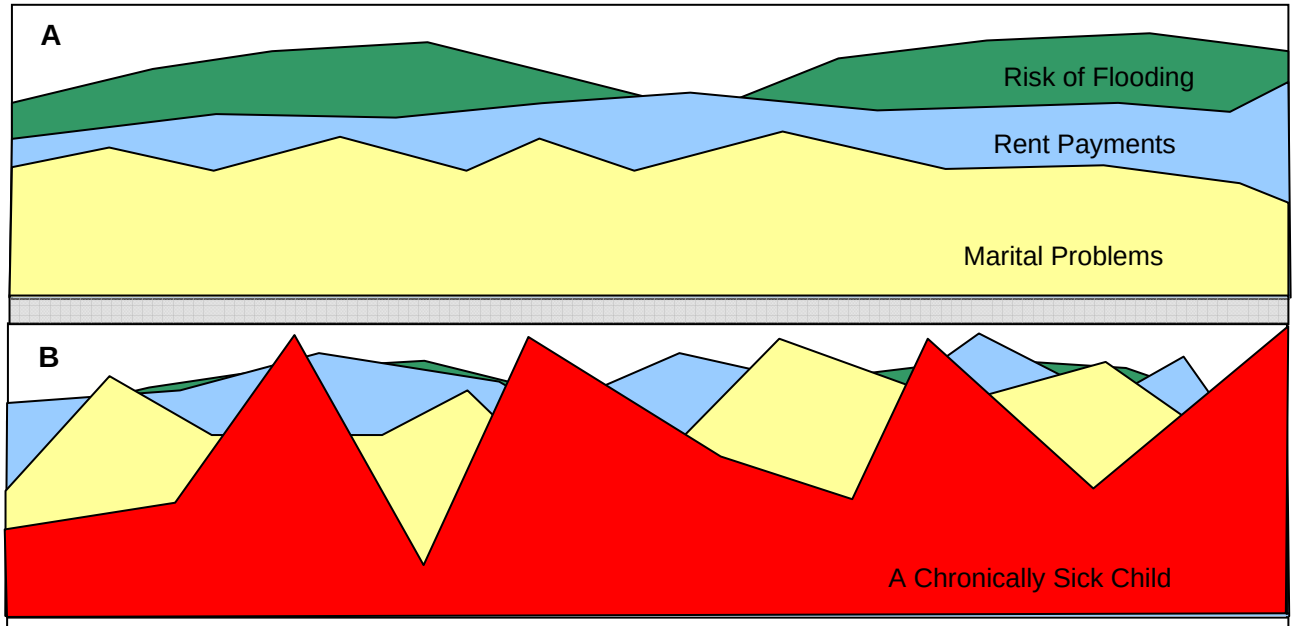


Figure 2.2: The conceptualised **Landscape of Disaster**.

Panel A illustrates a simplified risk ‘landscape’ as it might be perceived by someone whose day-to-day challenges are not particularly onerous (for them), but which are still sufficient to generate a cognitive topography of concern. Note that the risk of a low probability hazard, although distant, is sufficiently visible that it might encourage the individual to implement some measures to reduce it.
Panel B illustrates the cognitive topography of a different individual with the same concerns; however, these concerns are perceived as more intense than for the previous person. There is also an additional concern; that of a dependant and chronically sick child. Note that the risk associated with the low-probability flood hazard is all but invisible behind the other concerns and, therefore, it is unlikely to elicit any attention. Adapted from an idea by Wisner *et al.* (2004)

Weber (2006) suggests that this subjective balancing of risks actually occurs within a **finite-pool-of-worry**. Within this pool multiple risk concerns tend to fluctuate up and down in their subjective prioritisation. However, whilst one concern rises in priority another will tend to lower; regardless that the quantifiable characteristics of that risk have not obviously changed. In effect the finite-pool concept suggests that people can only

worry ‘so much’ and that risks perceived as ‘distant’ will tend to be those that are discounted.

This discussion, of both quantified risk and the subjective complexity of risk perception indicates that these processes are dependent upon not only data availability but also on many demographic, cultural and cognitive effects. The identification of these effects has been an important focus of research for several decades. This discussion will now move on to describe some of the theories that have been proposed to explain this complexity.

2.2.3 Psychometric Models

Work based on psychometrics focuses on expressed preferences and associated factors rather than preferences revealed through behaviour or categorised social archetype. It investigates phenomena such as how an individual chooses between two risky alternatives (Taylor-Gooby, 2004). These methods have, for example, identified three criteria that affect lay perceptions toward technological risks most strongly; dread, unknown risk and in some cases ‘number of individuals exposed’ (Bickerstaff, 2004; Taylor-Gooby, 2004). This method of risk assessment also highlighted the perceived differences between risks taken voluntarily and those to which individuals are exposed involuntarily.

Natural hazard events are predominantly regarded as presenting involuntary risks. This is because the consequences and costs of their occurrence are likely to far outweigh any benefits gained. Voluntary risks, conversely, are those that people accept more willingly through their own actions. This is because their benefits are considered to outweigh their costs: smoking and driving without a seatbelt are obvious examples. Individuals calculate voluntary risk according to personal judgments and lifestyles and the level of risk can be reduced, through either individual behaviour or through safety legislation (e.g.

the 1983 seat-belt legislation in the UK). In his seminal work on risk and voluntariness, Starr (1969) suggested that in order to obtain a certain level of benefits individuals are willing to accept voluntary risks ~1000 times greater than involuntary risks. This propensity is exemplified by Adams' (1995) description of Greenpeace activists prepared to endure extreme personal risk by crewing inflatable boats, whilst protesting against the involuntary risks of biodiversity loss or the movement of nuclear waste.

In this example voluntary risk could be viewed as 'acceptable' risk. However, Smith (2001) argues that in reality, rather than being willingly accepted, 'voluntary' risk often represents more of a 'least-worst' scenario for an individual. Consequently he suggests that the concept should more accurately be termed, **tolerable risk**. Risk tolerance is not about having the choice to put oneself in danger or not. Risk tolerance is concerned with **access** and the need for an individual or community to be able to sustain themselves in an environment where others make risk-management decisions on their behalf (see also Simmons & Walker, 1999, for a discussion of the expert vs. lay differentiations of risk tolerance). An example here would be the person who knowingly chooses to live on a floodplain because she perceives that the benefits of doing so (e.g. access to employment opportunities or to affordable housing) outweigh the potential costs. Such personal decisions constitute what Lupton (1999: p.79) terms "*pragmatic acceptance*", whereby, risk is regarded as neutral (i.e. the woman perceives that she can either gain or lose). However, treating risk as neutral, in the sense that a 50/50 benefit to cost ratio could be considered worthy of a gamble, must be tempered by the possibility that the risk taker's understanding of the true nature of her hazard exposure, of the inherent limitations of structural flood defences and of her own vulnerability, may be severely limited (Vogt *et al.*, 2008).

2.2.3.1 Heuristics

In addition to the categorisations of risk described so far, the field of psychometrics has also been used to suggest the existence of a number of cognitive processes that are invoked by individuals in order to simplify their risk decision-making. Tversky & Kahneman (1974) proposed that three heuristic elements of availability, representativeness and anchoring could be identified.

The **availability** heuristic presupposes that individuals' perceptions of risk are directly influenced by their personal or community memory of past events (the future as a mirror of the past). People only tend to believe that any hazard event they face will be equivalent to hazards of which they have direct and most recent experience (Burton *et al.*, 1993). Sometimes this cognition can be useful, as in the case of the Red River flooding described by Buckland and Rahman (1999). Here, as extensive flooding was gradually working its way down the river catchment, the local authorities tried to make the population in the flood's path evacuate by telling them that they were about to be swamped by a "6 foot wall of water". In this case the population were fully aware that previously the river had always flooded by gradual inundation. Accordingly, householders, aware of the need for labour intensive mitigation measures (e.g. sandbagging and the maintenance of pumps), stayed on their properties against the evacuation advice. Such behaviour, although criticised by the authorities, could be regarded in this case as a good coping strategy. Buckland and Rahman, however, argue this point from the other perspective. They suggest that in some communities within the Red River catchment people failed to evacuate because they simply didn't believe that the flood stage height was going to be as high as predicted (or as high as transpired). They suggest that it was only luck, rather than an inaccurate technical risk

assessment, that prevented many people being drowned (see also Chapter 3.3.3 for a different perspective on the Red River communities' responses).

Unfortunately, other experiences too have shown that resilience can not be built on the availability of information that allows hazards to be judged by past events. In New Zealand, Johnston *et al.* (1999) surveyed a community before and after it was subjected to an ash-fall from a nearby volcano. Before the minor eruption the community was found to be quite well prepared and many residents had evacuation strategies in place. After the minor covering of ash however, the availability heuristic allowed the population to change their perception of the threat. In the belief that the community had coped easily with this initial (quantifiably minor) event, there was a general tendency within the population to eschew relevant information about the possible magnitude of future events – that includes the possibility of activity up to super-eruption status. Instead the population generated two biases: an **optimistic bias**, which promulgated a feeling within the community that their household and local authority planning was better than average, and a **normalisation bias**. This allowed them to infer from their ability to cope with the minor impact that they also had the ability to cope with any future occurrence, or to assume that future events would not exercise an adverse effect upon them.

Dissonance can also occur within the availability heuristic. This is the most insidious form of misperception as it can occur especially in relation to the understanding of low probability/high magnitude events (Smith, 2001). Here, events are viewed as one-offs and risk cognition fades as the interval between impacts grows. In contrast, **probabilistic perception** describes a cognition that understands the random nature of events but passes the responsibility for them to a higher authority (e.g. God, the Government). Such perceptions inevitably diminish an individual's motivation for self-help through adaptive effort (*ibid.*).

Kates has used the phrase **'the prison of experience'** to describe the condition of availability (Kates, 1962: p.140). This phrase reifies the suggestion that people are trapped into making decisions on the basis of their personal memory and their understanding of hazard events. The rarity of large events naturally predicates that 'the prison' will become effective during any extended period of quiescence. Thus the spectrum of decision-makers' judgmental comparisons will be reduced. That people (especially men) have an "*inability…to conceptualise floods that have never occurred*" (*ibid.*: p.92), is a particularly cogent realisation for anyone wishing to understand the prisons and coping strategies of floodplain residents. This concept is also particularly apposite in relation to floodplain residents who are now facing the possibility of 'a shortening of the odds' in the future, as climate change appears set to increase the probability of flooding events (van Aalst, 2006; Wilby, 2007).

The **representativeness heuristic** presupposes belief that 'if A is such, then B'. This is illustrated where, given a limited amount of information, an individual will make assumptions about an outcome (e.g. Steve is shy, therefore he is more likely to be a librarian than a police officer: Tversky & Kahneman, 1982). The gambler's fallacy is a recognised form of representative cognition (*ibid.*). Following the occurrence of a environmental hazard event a 'gambler' will be inclined to disbelieve that such an event could occur again, in the same manner that someone betting on the roulette table would be unlikely to believe that an apparent run of either black or red would not be 'balanced' on the next spin by the appearance of the variant. Smith (2001) codifies this cognition as **determinism**; the layperson's non-acceptance of the random nature of hazard events. Common misinterpretations of the term '100 year flood' or "1 in 100 year flood" can act to encourage an individual's deterministic belief that large floods only occur within a cycle rather than as random events (Pielke Jr., 1999). Defining these events in probability

terms is suggested to minimise this confusion (e.g. 'There is a 1 in 100 chance of flooding in any given year in this location': E.A., 2008), but Bell and Tobin (2007) go further, by suggesting that damage estimates and concrete references to flood stage heights also need to be communicated effectively if risks are to be adequately understood.

Adjustment from an anchor involves the calculation of outcomes through the use of assessor-defined equations and basic information given as a start point. This heuristic is particularly sensitive to inaccuracy, both at the point of 'setting the anchor' (e.g. through the use of an inappropriate computational algorithm), or in making assumptions on the base information and then again at the point of adjustment, through the inappropriate use of additional evidence. Slovic (2001) suggests that risk estimated through anchoring is prone to be undervalued, because:

> "It is likely, for example, that an individual's intuitive estimates of size of a flood that would be exceeded only one time in 100 will be conservative (i.e. too close to his estimate of the 'most likely' flood magnitude), and he thus would allow too small a margin of safety in his protective adjustments." Slovic (2001: p.17)

The degree of **trust** a recipient has in the source of information can also affect the risk-weighting placed on that information (Kasperson, 1986). For example, work by Lombardi (1995) suggested that information received from trusted sources (e.g. scientists; Fire Brigade) is more likely to be acted upon than that received from, what are perceived to be, less credible sources (e.g. local politicians)[3]. However, a system that pits expert opinion against expert opinion has also been seen to be a cause in the public's lack of trust in professionals regarding risk. Wynne (2002) suggests that this tendency illustrates, not that the public are misunderstanding scientific proclamations about risk,

[3] *NB*. In the UK it has been found that politicians and journalists are amongst the least trusted public figures (Granatt, 2004)

but the opposite. He suggests that it is the fact that the public actually **does** understand the greater complexity of risk, beyond the reductionist terms of official risk frameworks, that leads to the degeneration of trust. This conceptualisation of trust, as being something that has to be earned by institutions will be discussed in Section 3.1.2.

Another issue in relation to trust is that it may be confused with problems in relation to the **affect heuristic**. This is a process that allows an individual to perceive less dread from a risk, as long as the perceived benefits outweigh the perceived costs (Finucane *et al.*, 2000). To use an example from an affect perspective: arguments over anthropogenic global warming indicate that currently employed mitigation policies will be insufficient to avoid 'dangerous' climate change in the future. This means that if it is decided that emissions need to be reduced to the 'safe' levels indicated by current scientific knowledge, then punitive measures will be required to effectively change the way society conducts its everyday life (Anderson & Bows, 2008). Projecting the impacts of current behaviour so far forward into the future, however, means that the cognitive desire to ignore the incipient hazard until these projected impacts start to counterbalance the benefits of the *status quo* are perhaps understandable (Weber, 2006). Unfortunately, in this example, to delay action until these impacts (costs) became obvious would inevitably consign future societies to more severe consequences than had precautionary measures been adopted earlier (IPCC, 2007; Schellnhuber, 2006; Schneider, 2004).

Regarding affect, the receipt of new evidence does not necessarily override intrinsic judgmental strategies in labelling a risk. It has been found that if the new information agrees with the recipient's initial perception, formed upon the receipt of limited primary information, then it is much less likely to be questioned than is additional evidence that requires a fundamental shift in strategic understanding. This is termed a **confirmation bias** (Nickerson, 1998). Poortinga and Pidgeon (2004) go further, by suggesting that if

something is regarded negatively (in their case it was GM crops), then any new information about it will be subject to a **negativity bias**. This means that even assessors undecided on the issue will find negative information more useful in drawing conclusions than positive information.

Sjöberg (2001) suggests that a weakness of the heuristic approach is that it is founded on the requirement for the subject to fully understand risk implications when arriving at a decision. Risk perception, though, in its subjectivity, has been found to be built on incomplete information. It has also been found to be affected by underlying beliefs and values (Krimsky & Golding, 1992). This is exemplified in the tendency for decision-makers to limit the perceived alternatives available to them to 'favourites', which have been heavily weighted by the individual's worldview. This has been referred to as operating in a state of 'bounded rationality'.

2.2.3.2 Bounded Rationality

Normative decision theory in risk decision-making supports the idea that decision-makers will always make decisions in a manner that maximises the expected utility of that decision (Slovic, 2001). Simon (1959), however, suggests that decisions are not made from a position where individuals are aware of all the alternative factors needed to be taken into account in order to arrive at a balanced utility-maximising decision. He suggests that the implementation of a theory of bounded rationality is appropriate for describing such operations. This is a method of '*satisficing*', whereby a decision-maker strives to attain a satisfactory rather than maximal achievement with the information s/he has possession of and that s/he understands. The weakness in this system is seen, however, in that such behaviour limits the use of situational scenarios to those existing within the experience or knowledge of the decision-maker. Also it is likely that the

imagined scenarios that are used will be affected by the individual's heuristic constructs of e.g. dissonance or determinism. Burton *et al.* (1993) suggest that:

> "To the degree that they follow such alleged procedures, people may be expected to examine a narrow range at any one time and to move the range along the wider spectrum, like the illuminating beam of a flashlight slowly scanning a scale in the dark." (*ibid.*: p.118)

Another form of bounding occurs when the costs to the 'system', of changes associated with the implementation of risk-reduction or business decisions, are perceived as being large. In this case it has been found that instead of acting to maximise utility through these expensive, major upheavals in process, a natural choice of a decision-maker is to use **the method of successive limited comparisons** (Lindblom, 1964). Lindblom describes this as 'muddling through', because only policy changes that move activity incrementally toward the desired utilitarian goal are considered.

Such use of limited alternatives will not just be due to specific lack of knowledge about technical matters but can be grounded in cultural traditions or existing regulations (Slovic, 2001). Floodplain development has, for example, been carried out historically in the knowledge that macro flood-defence measures will be financed. Accordingly, little effort has been expended on the development of either resistant or resilient building technologies, or until relatively recently, in refusing planning permission in the hazardous areas (Lee, 1993; Slovic, 2001; Wilson, 2006).

The psychometric paradigm has produced the most mature body of work within the field of risk-perception research. However, its individualistic and 'laboratory' style methods have been criticised as being blind to the environmental and social context in which a perceiver operates. Put simply, the methodology has been criticised for attributing risk construction to solely cognitive processes (Krimsky & Golding, 1992). Also, in its early stages it did not allow results to be aggregated across social groups (Renn, 1992). More

recent work has introduced certain affective cultural factors into the methodology as add-ons (i.e. world-view, gender and trust). However, there is still a distinction made, between subjective 'lay' perceptions and what are regarded as the more objective 'expert' interpretations of risk, which is roundly criticised outside the paradigm (Taylor-Gooby, 2004; Wynne, 2002). These, and other researchers, theorise that risk is constructed through much more affective social and cultural concerns.

2.2.4 Cultural and Social Theory

Culture is typically understood as "*the symbolic and learned social processes which generate and sustain shared norms and values between members of a social group"* (Taylor-Gooby, 2004: p.12). As such, culture cannot but have an effect in the way risk is perceived (Douglas & Wildavsky, 1982). In conceptualising the simplicity of cultural divides within society, Adams (1995) uses the idea of an icy path onto which two people must step. One is elderly and fearful of an injurious fall; the other is young and keen for slippery entertainment. Here, then, are metaphors for two 'cultures' that regard the features of an impassive world from totally different perspectives.

Such an example illustrates the concept of risk as being more of a cultural than a technical construct (Dake, 1991; Douglas & Wildavsky, 1982). To explain certain patterns that can be attributed to this conception, cultural theory has introduced a model of social categorisation. Within this model four basic cultural structures are suggested to exist within social institutions; fatalistic, individualistic, hierarchic, and egalitarian. Lain down in what is called a grid / group configuration these cultural institutions can be conceived as being situated on a point relative to two axes. This position will be dependent upon whether the group's philosophy is one of equality or social stratification (grid) and whether they view strength as being inhered within collective or individual

interests (group). Adding to these categorisations Schwarz & Thompson (1990) applied to the grid / group model 'four myths of nature' i.e. physical nature as; capricious, benign, perverse/tolerant or ephemeral. These typologies were directly related to the aspects of human nature within the grid/group and together they serve to refine the conceptualisation into a proposed map of human rationalities (see Schwarz & Thompson, 1990: p.9).

It is suggested that using this model it becomes relatively straightforward to see how dispute can occur within society, about what constitutes risk and what should be done to manage it. For example; a group founded on egalitarian principles who are keen that society should step lightly on an earth perceived as ephemeral, *cetera paribus,* will never reach agreement with a group of individualists who see nature as benign and capable of recovery from their personal 'trial and error' philosophy (Adams, 1995).

Whilst some authors are clear that these cultural delineations exist between groups and institutions (Rayner, 1992), others suggest that they can be identified through individuals personal attitudes and convictions (Wildavsky & Dake, 1990). Despite this, Sjöberg (2000) has criticised the theory as providing insufficient empirical evidence of its validity. He states that attitude, risk sensitivity and specific fear hold much greater explanatory power as risk percepts. Renn (1992) too, points out a number of limitations in cultural theory's explanatory power. These include a critique of the theory's reductionist partitioning of society into only four (or five) defining prototypes. He suggests that defining group segregation on the strength of hierarchy and openness alone is too simplistic, given the undoubted effects of other influences such as vulnerability or spirituality. Whilst critical, Renn (1992) does, however, agree that cultural theory provides a constructivist concept that does not fall prey to the apparent arbitrariness that characterises many of the other sociological approaches to risk perception.

The fact that cultural theory relates to the value attributes of groups and institutions is also problematic for others. Its tendency to aggregate the subjectivity of risk perception at other than the level of the individual has been criticised by several writers (Krimsky & Golding, 1992). Beck's (1992) *Risk Society* thesis does seek to individualise risk perception, but in a very particular sense. Beck suggests that the pervasive effects of globalisation, social reflexivity and the onset of a post-traditional social order have combined to create a society of individuals who regard the post-industrial world with doubt, reflexivity and anxiety (Mythen, 2004). Whilst it is focused squarely on the role of humans in the chronic production of risks, through their invention of technological hazards, the thesis could also be regarded as applying to certain flood risks. The proliferation of floodplain development and the reliance on technical risk-assessment techniques in the construction of defence measures has, in effect, exposed situated, and 'trusting', publics to potential harm. The issue of climate change and the empirical evidence that flood defences can and do fail could, from this perspective, be suggested to be analogous to the persistent threats from nuclear, chemical and GM technology and the other global threats around which the risk-society thesis is built. One could, for example, regard the 'escalator effect' (Parker, 1995) as one of Beck's 'residual' risks in microcosm; in that it was founded in an industrial era, when hubris dictated that all flood hazards could be controlled. This allows one to see how the recent policy shift, from institutional toward individual responsibility for personal flood-risk management (Section 1.5.1), could leave the public startled at the reflex-like nature of the policy re-orientation. Such an analogy fits Beck's own definition as an example of entry into risk society as occurring …

> "… at the moment when hazards which are now decided and consequently produced by society **undermine and / or cancel the established safety systems of the provident state's existing risk calculations**." (Beck, 2000: p.31, emphasis in original)

Here, policy-makers could be regarded as reneging on the state's historical and socially-deemed responsibility for flood risk mitigation, at the very time when the global threat of climatic instability is projected to increase future flood hazards. Society is, in effect, being left atomised in the face of uncertain, and perhaps indeterminate, levels of risk.

This example does, however, highlight limitations in this concept's application. Risk society is formulated on the pretext that post-industrial risks are democratic rather than hierarchic. However, in suggesting that all individuals are equally exposed to risk society hazards the analogy shows the weakness in the Beck's thesis. One main failing that Beck has been criticised for is that in concentrating on 'icons of destruction' he has failed to acknowledge that some individuals do have the capacity to insure themselves against lesser hazards (including flood hazards) and that there will not, therefore, be a common impact, or perception of risk, across social groupings in relation to anything less than cataclysm (Mythen, 2004). It is also suggested that the vulnerable sectors of society simply cannot afford the classless reflexivity that Beck posits and that this, in itself, predicates a reinforcement of social inequality (*ibid.*). Accordingly, these groups will remain disenfranchised from debates over 'global risks' as the hazards have no currency within these individual's personal landscapes of disaster.

Moving away from the *Risk Society* perspective, others contest that risk perception is by its nature, if not arbitrary, then at least founded on much more complex and involved factors than can be described by grand theory. These factors include values and the aforementioned trust. In addition, the social positioning of what can be referred to as indigenous knowledge is also seen as being particularly relevant (Satterfield & Gregory, 1998; Szerszynski, 1999; Wynne, 1992). Researchers suggest that the threads of this complex mix can be drawn out by using narrative approaches to interpret the richness of risk perception processes. Here, issues of dependency, vulnerability and the pressures

of modern living can be identified as influences in the construction and prioritisation of what might appear to be the legion of interconnected risks that can confront individuals as they negotiate their daily lives (Taylor-Gooby, 2004). Socially deliberated and contextualised narratives of this kind have been found to not even be about the 'risk object' at all (e.g. local job availability may be an over-riding issue that negates or taints all other concerns: Horlick-Jones *et al.*, 2003). Narrative interpretations, however, also highlight the limitations of technical risk-assessment processes in the face of knowledge possessed by 'lay experts'. For example, Wynne (1996) describes how hill farmers' vernacular knowledge of livestock grazing patterns correctly contradicted scientific estimates of how hill sheep would be affected by radioactive contamination from the Chernobyl reactor explosion. Yet, Wynne also describes the pervasive dependency that the farmers were required to place in the scientifically-derived knowledge, despite the fact that they themselves had witnessed just how contingent and uncertain this knowledge was.

This latter point also raises the issue of stigma. In the case raised by Wynne, farmers were required to concede to scientific advice because it was this advice, not the farmers' concerns, that was steering the political and policy response to the contamination incident. In this situation the farmers were doubly stigmatised. Not only were their views and understandings steamrollered by the formal institutions' reliance on scientific knowledge, but they were also stigmatised by the effects of the incident on their very livelihoods. These hill farmers, who were reliant on selling their sheep at market in order to generate income, were prevented from doing so because their livestock had been (literally) marked as 'unfit for human consumption' (*ibid.*). Whilst this is clearly a technological-hazard related example, stigma also has the potential to affect risk perceptions in relation to other environmental hazards. Specifically in relation to flood

risk, it could be suggested that the potential for stigma is a factor that could increase the prevalence of a dissonant response amongst floodplain dwellers toward any flood threat. Whilst settlements have been situated on floodplains since historical times, the recent spate of flood losses has provoked the insurance industry into suggesting that access to flood insurance is not a right for those living in these places (ABI, 2005). Accordingly, householders concerned about the stigmatising effect that any acknowledgement of their home's exposure to flooding could have on its market value, could hardly be blamed for invoking either threat denial or consummative trust in structural defences as coping strategies.

Findings such as these have clear implications for any communicators of risk information who might be tempted to implement a simple 'signal – transmission – receipt' model of information transfer (Walker, 2005). For as these two examples illustrate, even if risk messages are refined though psychometric or culturally sensitive filters before being transmitted to diverse publics, other knowledge-related or situational factors will inevitably affect the way such messages are interpreted.

Having identified a number of the contrasting approaches that have been formulated in an endeavour to explain the polysemous nature of risk, and the effects of socio-cultural influences upon risk perception, the discussion will now move on to examine the issue of how risk is communicated in more detail.

2.3 Risk Communication

Having spoken of the complexity of how risk is understood and the cognitive, cultural and knowledge-related influences on risk perception, it is now appropriate to illustrate how these factors can be acknowledged in the practice of risk communication.

Risk communication in relation to hazards takes four principal forms (Walker, 2005: p.3):

- *General awareness and preparedness raising to promote adaptive behaviour*. For example; the gradual shift in policy, away from structural flood defence and toward resilience building, has been promoted through a series of on-going flood awareness campaigns since 1998 (Bonner, 2007)

- *Messages to reassure the public about risks and concerns*. Whilst they can be focused more on technological hazards, these messages are also used to increase public confidence in the institutional capacity to cope with natural hazards. For example; communications which promote advances in the technologies of hazard prediction (Met Office, 2008)

- *Messages to educate people in how to behave during hazard events*. King (2000) suggests that the primary role of risk communication is to '*to provide targeted education and information so that people will behave safely and appropriately during a hazard, thereby minimising loss of life and property*' (p.223). This he suggests is because individuals need to be aware that they are likely to be 'on their own' during a hazard event.

- *Messages to warn and alert the public of impending events*. These messages form a crucial part of any flood forecast, warning and response system (FFWRS). If these messages are transmitted to a public who has no context within which to ground the information provided, then effective public response in unlikely (Johnson, 1987). This illustrates the importance of long-term awareness-raising strategies which act to normalise hazards and precondition the public to warning messages (Mileti *et al.*, 2004; Ronan & Johnston, 2005).

Whilst these four message derivations can be considered as discrete processes, Kirschenbaum (2003) agrees that during-event and post-event behaviours are guided by pre-event preparedness behaviours and norms. Accordingly, the raising of general awareness and preparedness is vital, as is the presence of the institutional response measures that are capable of influencing and facilitating the anticipated resilience-building behaviour and practice. Awareness raising in relation to low-probability hazards is, however, particularly problematic (Shaw *et al.*, 2005). Take school programmes as an example – which are chosen because it has been suggested that schooling offers the greatest potential for increasing community resilience (Briceño, 2007). Whilst children have the capacity to disseminate risk information from school-based programmes into

their social networks, it is hard to get children to identify with low-probability hazards. This is because such hazards are not perceived as a constant threat, so…

> "… when students are taught about [them] within the education system, although the students find the topic enjoyable, they view it from the point of an observer of calamity rather than from the perspective of someone threatened by or at risk from these hazards." (UNISDR, 2007: p.42)

Taking this into account, it is clear that even generalised hazards education needs to be exemplified as a process that is conducted with local relevance. By doing this, not only will the message recipient be encouraged to personalise his/her understandings and biases directly, but also the extremely localised nature of the contextual and human effects that can influence message processing will be brought to the fore. These contextual and human effects will now be discussed, before the chapter is drawn together in summary.

2.3.1 Contextual and Human Effects

It has been found that the social and environmental context in which a person is situated will affect the nature of their risk awareness and their responses during hazard events. These effects can be regarded as attributes of the physical environment or influences predicated on the nature of one's social or demographic characteristics.

2.3.1.1 Environmental Cues

Environmental cues can serve to influence awareness and response. For example, Thrush *et al.* (2005a) found that visual checking of river levels provides an important source of information that is regularly used to complement warning messages. Conversely, it has been found that during an event people are less likely to take a flood warning seriously if it is locally fine weather, or if neighbours or those around them are seen to be failing to respond to warnings (Fitzpatrick & Mileti, 1994). In relation to FRM

and formal awareness-raising, Ibrekk *et al.* (2005) acknowledge the influence of environmental features, by recommending that highly visible, permanently-sited indicators of potential flood depth[4] could be installed in high-risk areas as a form of long-term measure. However, from a community-resilience perspective, Defra point out the importance of engaging communities when deciding as to how or whether such visible indicators of exposure should be used:

> "…such signs need to be developed in close cooperation with the community and perhaps individualised to help build community ownership and reduce the chance of them being removed due to the prospect of blight." Defra (2003: p.viii)

In addition to this issue of community sensitivity to stigma, and whilst such measures may well have a potential to operate as a risk-normalising influence, it should also be remembered that Tapsell *et al.* (2005), found that signage performed badly across the board when used specifically as a flood-**warning** technology. An additional need, therefore, appears explicit for those engaged in FRM; that particular care be taken in defining whether any installation of physical features (e.g. flood marks, lights) is intended for either community awareness-raising, for warning purposes or for both.

2.3.1.2 Social Networks

Family connections hold particular sway in dictating how people respond and particularly how they respond to warnings. For example, it has been found that effective response to warnings is more likely to occur if there are more than two adults in a household (Thrush *et al*., 2005), or if there is cohesion within the household relationships (Drabek, 2000).

[4] For example: ""Flood columns" are a new concept of visualising flood risk in residential areas. They comprise a set of vertical Plexiglas pipes set up in front of flood prone buildings and filled with water up to the predicted flood level. These columns are meant to give residents a better understanding of the impact of flooding when flood protection measures are absent or fail." Ibrekk *et al.* (2005: p.7).

Furthermore, both resident and transient (i.e. touring) adult couples have been shown to respond to warning messages and evacuate from the path of hurricanes more expeditiously if they are in the company of dependant children (Drabek, 2000). Lone-parent households, however, along with lone householders, are less likely to be physically able to respond to warnings effectively, even if they are woman-headed and, particularly if they have no local network of friends or relatives (Fordham & Ketteridge, 1995; Thrush *et al.*, 2005).

In a worst-case scenario, where evacuation advice has been issued, Drabek (2000) points to evidence that indicates that closely-bonded kinship groups or networks tend to evacuate together and that this factor can have the affect of delaying any move to safety. This is because such groups tend to wait for all members to congregate before any are prepared to leave. In effect, any evacuation decision made by a group in the face of a severe hazard will inevitably be tempered by the trust and power issues that are prevalent within the group itself (Cordasco, 2006), as well as by the relationships the group has with the warning institutions or agents (Freudenburg, 1993). Furthermore, for many, even the presence of a pet in a household can result in failure to evacuate. The modern tendency for people to anthropomorphise their cherished animals means that if compliance with an evacuate request would result in the creature/s being left to the elements, or would require them to be surrendered into unfamiliar care arrangements then it is quite likely that the person will not acquiesce (Mileti *et al.*, 2004: p.2).

2.3.1.3 Age

> "A middle-aged person whose house was seriously damaged in a past disaster is likely to live in a house that he/she has made safer. On the other hand, youth and gender make people less likely to care about low probability high consequence events, or to take steps to increase their safety: most 20 year-old males are the least likely to do anything to protect themselves." (Twigger-Ross & Scrase, 2006)

Whilst this quotation suggests that increasing age can concurrently increase an individual's self efficacy and adaptive capacity, it can also have limiting effects. On the basis of Mileti's example, middle age could be regarded as representing the mid point in a normal distribution. This is because it is in these years that the most effective risk-mitigation behaviour can be achieved. The very young and the elderly are not regarded as being so adaptable. When it comes to responding to warnings, for example, the elderly may be simply too frail to react effectively. They may also not be prepared to respond due to biases resulting from previous experiences or because of feelings of rigidity, invulnerability or confusion (Ronan & Johnston, 2005)[5]. Contextually, the greater social isolation of the elderly can lead to a breakdown in communication channels, or a reducing exposure to or comprehension of risk communications (Drabek, 2000). Conversely, it has been recognised that education campaigns that are aimed at school children can be particularly effective in increasing awareness and responsiveness. This is because, although they are young, these individuals tend to disseminate information to older members of their households who do have the capacity and resources to implement the ideas (Twigger-Ross & Scrase, 2006). However, the young have a low capacity to initiate mitigation measures autonomously, particularly if their guardians or other authority figures are indifferent to the cause (HMG, 2005; Ibrekk *et al.*, 2005).

Whilst these are broad taxonomic categorisations of age effects, it should be remembered that mental and physical capacities are not so homogeneously defined in

[5] Unfortunately, during the Carlisle flood of 2005 the three fatalities that occurred included those of two elderly women who drowned in their inundated homes. Both these women had previously declined to be registered on the Environment Agency Automated Voice Messaging (AVM) service but it is not realistically possible to assess whether AVM registration would have saved their lives (E.A., 2005a).

reality. Any particular age-group cohort can contain those who are either more or less capable than their peers (Handmer, 2000). As Pitt (2008) so astutely puts it:

> "Of course, assumptions about vulnerability are just that – assumptions – which members of some groups might confound." (*ibid.*: p.333)

2.3.1.4 Ethnic Minority, Disability and Transient Grouping

The degree to which ethnic minority groups and disability groups are integrated into risk communication programmes can be directly related to how effectively messages are translated for those in the at-risk population who speak different languages or who have different physical abilities. For example, since the 1998 floods in the UK when certain identifiable groups did not receive warnings at all (Handmer, 2000), the Environment Agency has been trying to develop methods of reaching these people. These include the publication of information in seven languages and coordination with charities such as the RNIB and RNID (E.A., 2001). Unfortunately, just because information is provided in different formats does not necessarily mean that it is being used effectively. Robertson (2005), for example, reports that during her investigation of why the Environment Agency was having such limited success in engaging ethnic-minority groups into the formal flood warning system …

> "…a Sikh interviewee mused that as his community had been [in the town] for nearly 50 years and the Gurdwara was a landmark in the town, how could they be hard to reach." (*ibid.* p.60)

The problem, however, cannot solely be attributed to institutional inflexibility on the part of the responsible agencies. In addition to language problems, ethnic minorities, in particular, may not trust risk messages issued by the authorities for cultural reasons (Drabek, 2000; Thrush *et al.*, 2005). Tapsell *et al.* (1999) point out that the non-English speaking community are also less likely to listen to the radio or to follow the media. This

is because there are relatively few channels that cater for their needs. It has also been reported that the owners of some of those stations that do exist, do not feel it is appropriate that they should broadcast flood-related information at all (Thrush *et al.*, 2005). This represents a particular problem in relation to warnings, because it is recognised that such messages should be delivered through 'normal' networks and media rather than through *ad hoc* systems created for these specific broadcasts (Dynes, 2006; Mileti *et al.*, 2004). Robertson (2005) does, however, point out that if communication policy and practice specifically targets senior members of ethnic-minority communities then these individuals can provide important links into what would otherwise be highly exclusive social networks.

Regarding those with a disability, it is highly likely that sole occupants suffering disability or those being nursed by a young carer may completely miss risk communications and messages (Thrush *et al*., 2005). Accordingly, the Cabinet Office (2008) suggest that responding agencies need to work closely together in order to identify the potentially vulnerable or 'hard to reach' individuals or groups prior to an event. However, the issue of resourcing the potentially labour-intensive process of physically checking large numbers of people dispersed across a flood zone, within any limited hazard lead-time, is acknowledged as problematic.

Transient populations may find it hard to obtain relevant warnings. However, Drabek (2000) found that holidaymakers do tend to act appropriately by confirming risk information through contacts such as hotel staff and, where circumstances allow, by heeding environmental cues. Densely populated 'communities' of tourists (e.g. on coastal caravan parks) are, however, at risk, particularly given that warnings may be issued during the hours of darkness when environmental cues may not be so clear to see or to **comprehend** by those unfamiliar with them; notwithstanding that raging

hurricane force winds would likely be more than a little obvious to a caravan dweller. For this reason site operators are strongly encouraged (but not yet legally required) to prepare and maintain emergency plans and to make the details of these plans known to site residents (McEwen *et al.*, 2002; Twigger-Ross *et al.*, 2008).

2.3.1.5 Gender

Gender effects have been identified, not just through empirical observation, but also during psychometric risk-perception research. For example, in almost every case examined by Slovic it was found that white men had a lower level of risk perception than women and that non-white males and women perceived risk in a similar fashion. It is suggested that this may be due to power and privilege differentials, or through the white-males' cultural position, whereby they are the ones most likely to work with and gain benefit from certain hazardous activities (Slovic, 2001: p.xxxiv). This gender trait can be expanded upon in the context of environmental hazards through other research observations. For example, women can display higher levels of risk perception than men, but they may have lower levels of hazard awareness. However, this in turn can be countered by a female tendency to have more belief in a warning message than men (Drabek, 2000; Fitzpatrick & Mileti, 1994). In relation to another hazard, Betts (2003) identified that women and children in Australia actively take on responsibility for bushfire preparedness and response drills. She suggested that this was most easily explained by the fact that women and children were most likely to be at home and, therefore, most at risk during the day. Kirschenbaum (2003), however, introduces another reason that households under the leadership of a woman respond more effectively in the response phase of a hazard event than do those organised by men. He suggests that whilst this effectiveness is partially due to the female tendency to be risk averse, there is also a **'mother-hen effect'**, whereby, mothers initiate actions to protect their progeny much

earlier than do fathers; notwithstanding that families with dependant children will generally take action more readily than those without (Fitzpatrick & Mileti, 1994). It should be noted, however, that simply because women may respond more quickly to warnings, does not mean that they suffer lesser consequences as a result. In fact the opposite is generally true. Women, especially in women-headed households, tend to suffer greater consequences from hazard effects than men because there exists a gender divide that leaves women disproportionately responsible for children, seniors, the chronically ill and disabled members of the family during the warning period and beyond (Enarson & Fordham, 2001; Morrow, 1999).

2.3.1.6 Socio-economic Status (SES)

It has been found that an individual's socio-economic status (SES) can influence his/her response to hazard warnings. A curvilinear relationship has been shown to exist across the SES scale, with those of the highest and lowest income and education levels being less likely to respond (Drabek, 2000). The level of an individual's community involvement can also be seen to have a direct influence on the number of times a warning is received and, therefore, how effectively the message is confirmed. Those of lower SES are perceived as having fewer social linkages and, therefore, as being less able to believe and personalise the warning (*ibid.*). Fordham & Ketteridge (1995) describe how communities of low SES can develop antipathy towards authority; this can reduce the trust and credibility with which an official warning might be received. Thrush *et al.* (2005) point out that lack of education too, can lead to the significance of warnings being misinterpreted. The effect of affluence will be discussed later (Section 3.2.3) but in short, networks containing affluent individuals and groups, can represent a 'double-edged sword', whereby a high level of lateral and vertical interconnectedness can lead to

community members being unwilling to take direction from information sources that they perceive as being of equal or lower status to themselves (Buckland & Rahman, 1999).

A final set of factors, which are capable of influencing how risk communications are received, processed and acted upon, has now been discussed. Taken together, this information makes it clear that in order to elicit effective responses, overcoming the sheer diversity of potential environmental, contextual and cognitive effects on the publics' risk perception and quantification, poses a significant challenge for any risk communicator.

In relation to low-probability hazards, concerns over the complexity of these influences have particular currency. Ronan and Johnston (2005) explain that for individuals or communities that are straining beneath any number of pressing concerns (other than those related to environmental hazards), believing that only occasional education programmes are going to lead to long-term behavioural change is an unfounded notion. Such programmes, they suggest, need to be persistent and they need to be supported by different lines of evidence. They also need to be presented as part of a coping model (i.e. "*There is a concern but there are effective things that you can do about it*"), and they need to be delivered through a partnership of school, community and hazard-related organisations (*ibid.*).

Taking the complexity of quantified and subjective risk perception, and the numerous other affective factors into account, Mileti *et al.* (2004) have described a checklist of 'immutable principles'. They suggest that these are used by those responsible for increasing community awareness and preparedness, to guide them through the intricacies of public risk communication process. These principles include: positioning information in the community; adapting materials to local contexts and the need to

address diverse publics (*ibid.*: p.8-10). Increasingly the necessity for these principles to be utilised in risk communication has been recognised. Particularly, as the importance of public engagement with risk management and the need to inform the public of environmental risks becomes written into a broader range of legislation (Deeming & Walker, 2008).

The preceding sections have reviewed many aspects of the current state of knowledge, in relation to the multiple aspects of risk, risk assessment and the many factors involved in risk perception. The challenges to and stratagems for effective risk communication have also been discussed. The chapter will now be summarised.

2.4 Risks, Risk Perception and Coastal Flooding: The Research Challenge

In this chapter, risk has been defined as a social construction. The justification for this has been detailed in two ways: (1) through the investigation of the assumptions made in relation to quantified-risk assessment practice, and (2), through the description of the cognitive processes that are suggested to simplify or orientate an individual's personal understanding of how risk affects him or her self. Theories of risk perception have been introduced. These have been suggested as providing potential, and sometimes conflicting, means to categorise and understand risk perceptions from cultural and psychological perspectives. Adding context and human characteristics into the risk equation has been seen to add yet another layer of complexity to the understanding of the concept. The challenges faced by risk communicators, charged with passing information into such a tangled, socially and environmentally defined milieu, have been described. However, at this point in the discussion a question needs to be asked: If so much is apparently known about the intractable nature of the way risk is defined, perceived and socially engaged, what can this project add to our knowledge?

Risk research to date has, undoubtedly, revealed a great deal of information about the concept. Such information has been found useful and has been broadly utilised by risk communicators to develop communication strategies (e.g. NSCWIP, 2007). However, the methods used to ascertain what constitutes a risk percept have been criticised as being overly individualistic and reliant upon 'blunt' quantitative data (in the case of psychometrics), or too simplistic (in the case of cultural theory). More recent research has identified the importance of grounding risk perceptions into the local context. Such an approach concedes to the existence of the situated tangle of concerns, priorities and knowledges. The narrative, or dialogic, interpretations that these methods encourage have particular relevance at that same local scale.

Acknowledging the importance of understanding risk as it is experienced locally, has been identified as providing a significant step toward building community resilience against flood hazards (Buckle *et al.*, 2003). Therefore, this project is adding to knowledge, because there has been little or no similar research conducted regarding low-probability sea-flood hazards before (Shaw *et al.*, 2005).

In order to address the project's aims and objectives, certain questions will be focused on testing assumptions made on the strength of work reviewed in this chapter. Particular reference will be made as to the nature of how risk is constructed, through the interactions and shared understandings held within and between different social networks within the at-risk communities. The investigation of how these networks operate, in mediating risk percepts on a day-to-day basis, will reveal important information in relation to how these communities assess and manage their risks. Such findings will have direct relevance in a policy arena where 'the local' is becoming an increasingly important scale in relation to the management of flood risk (e.g. Pitt, 2008).

The complexity of risk perception and of defining risk itself has now been discussed, as have the issues surrounding the formidable task of communicating risk information. The next chapter will introduce another concept. This is a concept that provides the project with a lens through which to examine how coastal flood risks are engaged (or not) by three separate and exposed communities. Chapter 3 introduces **social capital**.

3 Community, Social Networks and Social Capital

3.1 Introduction

Previous chapters introduced and described the focus of the project (community resilience to storm-surge flooding) and explained the nature of the coastal flood hazard. In Chapter 2 a literature review was conducted into what is understood by the terms, risk and risk perception. This chapter will now move the discussion on to investigate another concept which is to be useful within this investigation; social capital.

The influence of social capital in influencing an individual's success or failure has been debated for several decades (Bourdieu, 1985; Coleman, 1990; Loury, 1977; Putnam, 2000). More recently, the concept's use within adaptation and disaster studies has become evident (Adger, 2003; Dynes, 2002; Pelling, 2003). This chapter will review the varied interpretations of what it is that is actually perceived to constitute social capital. The fundamental elements of the concept will then be explained in a way which illustrates their relevance to this project, and demonstrates the value of their use in the analyses to follow.

3.2 Social Capital

> "For individuals and households, associational relationships within communities provide one of the mechanisms through which people organise their activities, circumscribe their identities and muster resources. By virtue of belonging to particular place-based or interest/kinship-based communities, individuals can either increase or decrease their vulnerability/resiliency to a host of potential natural, technological and biological hazards" (Murphy, 2005: p.298)

In their contrasting definitions of 'social capital' Bourdieu (1985), Coleman (1990), Putnam (2000) and others, have given the field of sociology important tools with which to investigate different place-based or interest/kinship communities. However, the role that networks and shared norms have, in either promoting or retarding an

individual's well-being, has principally been associated as having direct relevance to economic theory (Field, 2003). Accordingly, the debate in the literature has focused on whether social capital represents a quantitatively accountable fungible asset, rather than whether it represents a community resource for use in resilience building (e.g. DeFilippis, 2001; Sobel, 2002). Since the 1990s the World Bank has viewed the strengthening of social capital as being a way to shape sociological and economic perspectives in a way that enables the mobilisation of other growth-enhancing resources (Woolcock & Narayan, 2000). In the UK, the development of social capital has been looked upon slightly differently. Here the government has regarded it as a means of implementing 'costless' community improvement within the 'Third Way' discourse (Mohan & Mohan, 2002; Kearns, 2004).

The concentration on the economic utility of the concept is, however, limited by its failure to appreciate the importance of social capital as an aid in vulnerability reduction. Dynes (2002), claims to be the first author to use the concept in the investigation of community disaster response, whilst Adger (2001) and Pelling (2003) have used it to explore social adaptive capacity toward climate change. There has, however, been little work with this concept at anything below the level of formal institutions[1] to identify how network-based perceptions and risk responses are influenced by socially cohesive norms and networks within a geographically-bounded population. The next section details how the concept of social capital has developed over recent decades to become a useful, although problematic, measure of community cohesion, which has been used to inform research and policy decisions across a number of scales.

[1] "Institutions represent "the rules of the game" and provide common ground for negotiation and power-enactment between individuals and groups. Formal institutions (legislation/guidelines etc.) are openly negotiated rules that constrain agency and yet are amenable to change by the action of individuals and groups. Informal institutions are found in cultural norms and values, giving shape to, whilst being reproduced by, repeated rounds of customary behaviour" Pelling & High (2005: p.3)

3.2.1 What is Social Capital?

Through the 20th Century, many writers experimented with the concept of social networks in order to explain the truth of the aphorism "it's not **what** you know, it's **who** you know". The function of economic (money) and physical capital (material goods) was clear and the understanding of human capital (education and skills) was relatively easy to equate with personal furtherance, but all these things together still did not explain why some prospered, whilst others with ostensibly similar characteristics stagnated. In seeking an explanation for this, Loury (1977) wrote:

> "The social context within which individual maturation occurs strongly conditions what otherwise equally competent individuals can achieve. This implies that absolute equality of opportunity, where an individual's chance to succeed depends only on his or her innate capabilities, is an ideal that cannot be achieved. … An individual's social origin has an obvious and important effect on the amount of resources that is ultimately invested in his or her development. It may thus be useful to employ a concept of "social capital" to represent the consequences of social position in facilitating acquisition of the standard human capital characteristics." (Loury, 1977: p.176)

This viewpoint was built on by Bourdieu (1985), who suggested that:

> "Social capital is an attribute of an individual in a social context. One can acquire social capital through purposeful actions and can transform social capital into conventional economic gains. The ability to do so, however, depends on the nature of the social obligations, connections, and networks available to you." (Bourdieu, 1985: p.242)

Social capital was, therefore, according to Bourdieu:

> "…the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition – or in other words, to membership in a group – which provides each of its members with the backing of the collectivity-owned capital, a "credential" which entitles them to credit, in the various senses of the word" (*ibid.*: p.248)

Implicit within these definitions is the suggestion that social capital is an individual 'good' for use as a credit in transactions. Bourdieu's approach was to use social capital to explain class, class division and the disparity between individuals'

achievements at school (DeFilippis, 2001). As well as representing it as a form of fungible capital he affiliated it with the propensity of the social elites toward the patronage amongst peers; something which Putnam *et al.* (1993) would describe as '*amoral familism'*. Bourdieu identified this as being an important factor in the maintenance of the hierarchical class system. He tightly linked the social network elements of his concept with the idea of capital; in his eyes it was no good having network ties unless they could help to achieve the ultimate goal, i.e. the production of financial capital. Power relationships, within Bourdieu's concept, are regarded as a fundamental part of associational activity at any level, with conflict and '*symbolic violence'* (the implementation of coercive norms on members: Bourdieu & Wacquant (1996) op. cit.: Siisiäinen, 2000), rather than trust dictating an individual's access to the benefits of such collaboration (i.e. the social capital) (Siisiäinen, 2000). It is due to this conceptual axiom (i.e. that all associations are **power** relationships) that **competence** is described as the way in which the elite justify their hegemony over the poor (who lack power). The existence of an underclass that is undeserved of capital rewards – because they lack the necessary competence to deal with them – is therefore legitimised in the world view of the members of the privileged groups (*ibid.*).

This hard egocentric view of social capital as being a factor only available to the elites is not carried into the work of Coleman (1990) or Putnam (2000). For Coleman, who like Bourdieu built his concept to explain the differences in educational attainment amongst schoolchildren, social capital is…

> "…defined by its function. It is not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of a social structure, and they facilitate certain actions of individuals who are within the structure. Like other forms of capital, social capital is productive, making possible the achievement of certain ends that would not be attainable in its absence" Coleman (1990: p.302)

Coleman herewith introduced a cautious shift from the individualistic elite recipients of Bourdieu's capital, to a wider audience and to the notion that the concept can be regarded as a **public good** (Adam & Roncevic, 2003; Pelling, 2003) i.e.

> "[T]he kinds of social structures which make possible social norms and the sanctions to enforce them do not benefit primarily the persons whose efforts are necessary to bring the norms and sanctions into existence, but all those who are part of the particular structure." Coleman (1990: p.316)

Mohan and Mohan (2002: p.192) suggest that this 'particular structure' should actually be conceptualised as being extremely inclusive. This is the important perspective which sets the concept of social **capital** apart from the social **networks** around which it forms. Social networks are almost by definition, exclusive, but social capital is inclusive[2]. This public-good aspect, is in direct contradiction of Bourdieu's opinion that group leaders do not act altruistically but only in self-interest (Bourdieu, 1991: p.88). Coleman also introduces **closure** (the strength of inter-actor expectations and obligations that generate trusting relationships), **stability** (the institutionalisation of position rather than person within a network) and **ideology** (the emphasis placed on network members to act in accordance with group rather than individual interests), as playing roles in social capital formation. Using these criteria Coleman categorises social capital into six forms (Table 3.1).

With these categorisations Coleman promotes social capital as being "*created when the relations among persons change in ways that facilitate action"* (Coleman, 1990: p.304). Woolcock and Narayan (2000) were later to expand this definition in their description of the concept as "*the norms and networks that enable people to act **collectively***" (p.226). Putnam (1995) contends that if these norms and networks link large proportions of the community, and succeed in spanning underlying social divides, then enhanced cooperation is likely to serve broader interests. Such a factor

[2] To illustrate this point it might be prudent to consider an elderly woman who might chastise a child whom she does not know for dropping litter, because such an act would be considered a 'norm' by the population of the place (street, neighbourhood or municipality) where she lives.

could be seen as enhancing Coleman's 'appropriable organisations' into a more broadly conceived 'appropriable community'.

Table 3.1: Coleman's six forms of social capital. Source: Coleman (1990: p.306-312)	
Obligations and expectations	Reliance on reciprocal actions and the trust that a resource will be there to be drawn on when needed. The measure of outstanding obligations is a measure of the interconnectedness of the members
Informational potential	Interaction can produce a learning environment supernumerary to the origin network function. Networks can act as conduits for information generated by and gleaned by network members
Norms and effective sanctions	Norms provide rewards for specific behaviour or sanctions for wrongdoing. Norms that subjugate self-interest can represent particularly strong social capital.
Authority relations	Rights transference to a charismatic leader within the group can result in this actor controlling significant social capital with which to concentrate on certain activities.
Appropriable social organisations	Social networks conceived for one purpose (e.g. to lobby against a new road) can be transformed if the goal is re-defined (e.g. to lobby against wider environmental issues).
Intentional organisations	The investment itself, required for the production of social capital has other benefits. The act of designing and structuring norms and obligations results in the public benefit of trust and confidence building.

Putnam's work, like that of Coleman, splits social capital into key components. These are the **cognitive** aspects of social capital i.e. the moral obligations, norms and social values (especially trust), and the **structural** aspects i.e. any engagement with social networks (especially voluntary associations). Splitting the concept into properties like this allows, the understanding that…

> "…the two kinds of social capital are intricately linked; [and that] structural and cognitive social capital can be identified along a continuum from the societal to local to individual levels" (Moser & McIlwaine, 2001: p.113).

With social capital fundamentally conceptualised as an amalgam of the societal trust, reciprocity and social networks[3] that operate together to facilitate collective action (which, importantly, is capable of achieving **public good**), these components will now be discussed in more detail.

3.2.2 Trust

The importance of **social trust**[4] is recognised as being a fundamental cognitive dimension in the development of social capital. In his argument Putnam (2000) analysed the trends of social trust in the US to illustrate this point. Indicators of trust have been measured for many years and Putnam used evidence gleaned from these data to support the idea that as social trust has declined in the US since World War II, so too has social capital. The split between urban and rural populations and the "haves" and "have nots" is also highlighted, in that Putnam suggests that country dwellers and the more wealthy appear to be more trusting. Importantly, Putnam clarifies that individuals' levels of trust are likely to be developed with the benefit of actual, long-term (good or bad) experiences in life or their local environment, rather than simply through subjective perception (see also: McCulloch, 2003). This is a factor that he uses to explain the relative paucity of social trust amongst ethnic minorities and the poor, whose life experiences he posits are more likely to be negative. An important aspect of Putnam's analysis is that the reduction in levels of trust is seen as a demographic issue. He points out that people born in the US earlier in the 20th Century, have retained high levels of social trust, whereas those cohorts born later in the century start with, and maintain, progressively lower expectations of societal honesty.

[3] Fukuyama (2001) disagrees with this understanding. For him trust and networks are epiphenomenal and social capital is, rather, more dependent on virtues such as honesty, the keeping of commitments, reliable performance of duties and reciprocity.

[4] Social trust is defined here, in the standard terms of this literature, as the generalised willingness of individuals to trust their fellow citizens.

Some transference of Putnam's findings in relation to trust is found in Hall's analysis of social capital trends in the UK (Hall, 1999). Whilst rejecting Putnam's proposition that social capital has declined since the introduction of the television, Hall did find that the level of social trust amongst the young in the UK also became particularly low during the 1990s, and the willingness of those under 30 years of age to participate in opportunistic behaviour – i.e. that which benefited the individual at a cost to the community – increased at the same time.

From the perspective of the individual rather than the nation, people can be separated into groups of **generalised** or **particularised** trusters (Pelling, 2003). Generalised trusters are represented by Wenger's (2000) 'boundary people' who are capable of trusting strangers and are more willing to volunteer. These people will bridge networks with what Putnam classifies as **thin trust**. In contrast, particularised trusters are self-limited by a willingness to only place faith in people within close social groups; particularised trusters form bonded (see below) networks of **thick trust**.

Giddens (1990) identifies that systems or institutions may be recognised as trustworthy, simply through their role, or that of their representatives in society. This type of **trust in authority** is built differently from the other two variants and can be reliant upon credentials and reputation rather than on personal experiences. Pelling (2003) cautions that trust in authority should be kept conceptually quite distinct from the more informal social trust. He points out that such trust can act as an inappropriate proxy indicator for the presence of social capital in communities where it does not necessarily exist. This type of trust was discussed in Chapter 2, in relation to risk perception. In effect, the argument goes, that trust in authority does not necessarily relate to trust as in the sense of, "you are trustworthy" or "I have trust in my relations with you", but can be more appropriately encapsulated by the statement "I declare my dependency on you". Whilst it is somewhat different from social trust,

this particular framing of it, as an institutional or authority issue, should not be regarded as an unambiguous sign of perceived subordination on the part of the **truster**. The indication of dependency can also have a perlocutionary effect, whereby, its invocation compels the **trusted** agent or organisation to live up to certain promised responsibilities (Szerszynski, 1999; Wynne, 1992).

3.2.3 Reciprocity

"*Every gift is a hook*" (Gilchrest, 2001: p.38)

In a similar fashion to the differentiation of trust, Putnam also outlines two distinct types of reciprocity that are present in society; **balanced** and **generalised**. Balanced reciprocity refers to any direct exchange between friends e.g. two households' mutually agreed participation in a 'school run', where the pick-up and drop-off duties are equally shared. Although balanced reciprocity is important, as it requires an element of trust, it is the degree of generalised reciprocity within a community that is a much more important gauge of social capital (Putnam, 2000). Generalised reciprocity takes the form of 'paying it forward' i.e. performing a deed, not on the basis of anticipating an immediate 'repayment', but with the perception that the act could be reciprocated at some point in the future. According to Putnam (2000), generalised reciprocity is a fundamental norm within civil society and represents a means whereby 'transaction costs' can be reduced. In effect, if you can operate with a perception that if you do a favour for someone, then when you need it there will be someone there to do a favour for you, it reduces the need for formal agreements, it reduces stress and it lubricates frictions. Norms of reciprocity are seen as the important element in developing networks of weaker ties. This is because within these networks, sanctions cannot be directly enforced through tight 'family' values or expectations (*ibid.*). It is these norms of mutually reinforcing relations between actors and institutions that Coleman (1990) refers to as **closure** and Fukuyama (2001) classes as **instantiation**.

3.3 Bonding, Bridging and Linking Social Capital

In order to achieve closure it is necessary for there to be a framework of social networks within which social capital can operate. In confirming this, Putnam, requires there to be an understanding that even though any 'community' might contain a large number of virtuous people, if there are no social networks then there is no social capital (Putnam, 2000: p.19). In imagining these network structures, Putnam is, again, influential, because he has introduced the categories of **bonding** and **bridging** social capital. He has also quantified the roles of these sub-concepts through substantial (if rudimentary: Sobel, 2002) empirical analysis. Woolcock and Narayan (2000) add to these two categories a third, powerful, category of **linking**. This is an important network attribute, through which communities can be effectively wired directly into governance structures. The following discussion differentiates and describes these three network types[5].

3.3.1 Bonded networks

Bonded social capital is based on friendship and kinship (Adger, 2003). Such ties are important because they can be very strong as a result of the intra-network behavioural norms that they generate, e.g. strongly bonded social capital has been identified as being the power behind the success of several immigrant enclaves within the US (e.g. the Italians in New York - DePhilippis, 2001). The problem with bonded networks is that they can become exclusive and restrictive (*ibid.*; Leonard, 2004). For example, solidarity in the face of adversity or injustice could be seen as a very positive aspect of tightly bonded networks. However the persisting, or perceived need for collectivised renitency to constitute a fundamental network function, can lead

[5] The discussion concentrates on the types of informal networks that involve physical interaction between members; therefore, it will not investigate what Putnam refers to as 'tertiary' associations. These are groups or organisations (e.g. Greenpeace) to which increasing numbers of people ostensibly belong but to which members contribute no active networking role other than to, for example, receive mailings that report the exploits of the group's activist clique.

to ‘us’ versus ‘them’ sectarian violence and the segregation of minor groups (Gilchrist, 2003). Furthermore, if ‘civil society’ is defined as “*individual and collective action towards the common good*” (Knight *et al*, 2002: p.60), it can be seen that certain ostensibly bonded groups represent what Rubio (1997) referred to as ‘perverse social capital’ and Putzel (1997) as its ‘dark side’. For their part, Portes and Landolt (2000) identify four particularly …

> “…negative consequences of social capital: exclusion of outsiders, excess claims on group members, restrictions on individual freedoms, and downward leveling norms." (*ibid.:* p.534)

In this respect Putnam has been roundly criticised for his assertion that the promotion of associational activity will generally lead to good outcomes, with only minor discussion of the darker possibilities it offers (Field, 2003). An example of activity that represents the antithesis of a ‘good outcome’ is the Ku Klux Klan (Knight *et al.*, 2002). This is a group whose internal cohesion, in all essence, represents a bonded network. However, the negative externalities of segregation, supremacy and sectarianism that are inflicted upon the larger society into which this fraternity is embedded, imply little relationship to the ideals of civil society (Knight *et al.*, 2002; Fukuyama, 2001).

From a more hazards-related perspective Cordasco (2006) describes the ‘dark side’ of bonding social capital more in the paradoxical sense, in that whilst it is regarded as a positive attribute for vulnerable individuals and groups to possess, it can have a negative influence because of its propensity toward producing “**overembeddedness**” (*ibid.*: p.5). Cordasco reports that in New Orleans, in the hours immediately prior to the arrival of Hurricane Katrina, tightly-bonded family groups failed to follow the formal evacuation orders. They failed because they were ‘obligated’ by existing norms of group behaviour. Individuals were required, for example, to heed the instructions of the more mature group members to ignore the warnings because these matriarchal figures considered there to be no need to worry. This is an

example of what Kirschenbaum (2003) refers to as the operation of a 'network-gatekeeper effect', whereby, the cognitive biases of a network's most influential member can serve as a filter to influence the response efficacy of the whole network.

Leonard (2004) illustrates the exclusivity of such networks in terms of how members are selected. During her research in Belfast, she found that involvement in sectarian groups was not just dependent on one's ideology, but also required the capacity for reciprocal action. This resulted in the vulnerable and elderly being excluded from networks whose membership required an understanding that "*one good turn deserves another*". Glaeser (2001) adds to this by implying that an individual's lifetime social capital quotient generally forms a bell-shaped distribution curve. He suggests that the most social capital is available at an individual's mid-life point, when fitness and the capacity to reciprocate favours are at a maximum. However, from the perspective of community action it might be appropriate here to consider findings that suggest that the elderly, although less physically capable, are generally more trusting than the young (Hall, 1999; Putnam, 2000). Does such a propensity, for the elderly to trust, override individuals' physical limitations in generating reciprocity? McCulloch (2003) suggests that this might be the case. He reports that it was the older participants in his survey (and those with dependant children) who reported the highest levels of social capital. Furthermore he suggested that:

> "Older adults appear to have stronger feelings of commitment to their neighbourhoods and so may be an important source of community action and involvement." (McCulloch, 2003: p.1436)

3.3.2 Bridging networks

Bridging social capital relates to slightly weaker ties that link network members to more distant individuals. Whereas a bonded network might be represented by a family, a bridged network would represent more of a 'community of interest', such as a group of work colleagues or an environmental group. Putnam (2000) suggests that,

whilst bonding social capital is good for “getting by”, bridging social capital is good for “getting ahead”. In effect, by developing more distant ties it is held that one can be exposed to a greater potential for personal development. In his analysis of an office environment, Burt (2001), identified certain heterodox individuals, or **boundary people** (Wenger, 2000), who were capable of accessing multiple, exclusive, intra-departmental bonded networks (bridging what Burt termed ‘structural holes’). These individuals, he suggested, were not only more likely to be listened to by peers but were more likely to gain promotion. This is an example of what Putnam describes as bridging activity representing “*sociological WD-40*” as opposed to bonded capital’s “*sociological super-glue*” (Putnam, 2000: p.19). Granovetter (1983) agrees that the evidence points to networks constructed of ‘weak ties’ between acquaintances being significantly more successful in facilitating the achievement of a goal than are strongly tied bonded networks. However, he stresses, that to be successful, these weak ties need to connect individuals who operate within diverse institutions, rather than simply as networks of friends-of-friends (which he does not see as ‘bridging’ relationships but as an extension of bonding).

From a hazards perspective, the term “**Therapeutic Community**” relates to the tendency, within a disaster impacted community, for neighbours to bridge together in solidarity against what can be considered a ‘common enemy’ (Alexander, 2002). Examples of this effect were recorded during the review of the 2007 summer floods:

> “[T]he need for the community to pull together resulted in new relationships forged with neighbours. People, especially those who were vulnerable, often relied on neighbours for help and support during the flood and clean-up phase, whether in the form of cups of tea, hot meals, loans of equipment, help with cleaning or emotional support. As one householder summed up, “you realise how good people are”. Pitt (2007: p.27)

Such behaviour occurs most strongly during the recovery phase, as people work together in order to return to ‘normal’ (Enarson, 2001), but altruism also occurs during the warning and response phases (Dynes, 2005; Drabek & McEntire, 2003).

Rodriguez *et al.* (2006), for example, describe the institutionalisation of operating norms within emergent informal social groups during, and in the aftermath of, Hurricane Katrina[6]. Tompkins and Adger (2005) suggest that this crisis-initiated informal institutionalisation can serve as an important tool, which needs to be acknowledged within more formal recovery strategies.

3.3.3 Linking networks

Linking social capital extends further the possibility for collective action through social contact (Woolcock & Naryan, 2000). Through linking, social networks have the ability to connect up through hierarchical network structures in order to leverage resources, ideas and information from formal institutions beyond the community (*ibid.*). Adger (2003) points out, however, that once networks start to develop through a hierarchy in this manner, the enforcement of sanctions is more likely to be undertaken through formal and legal institutions rather than through the informal rules of trust. One example of a network that has successfully linked is the National Flood Forum (NFF). This group initially formed out of a strongly linked network in the town of Bewdley following severe flooding in 2000. The group subsequently obtained several years of Environment Agency funding for their work advising other flood groups around the UK (NFF, 2008).

Adger (2003) uses the example of the Buccoo Reef Action Group in Trinidad & Tobago to illustrate the effectiveness of a civil-society network linking with government in order to enhance community adaptive capacity to climate change. The linking of networks for the protection of Buccoo Reef is shown to offer two significant benefits (*ibid.*: p.398):

[6] This informal organisation resulted in, for example, group members agreeing not to carry weapons during their rescue activities: An indicator of consensus which could perhaps be regarded as characteristically North American?

- It provides a resource for coping with extreme weather. This is because the networks, which are linking to facilitate the improvement of participatory governance on the islands, also include the people who are responsible for emergency planning. Therefore, appropriable communication links exist that can be utilised at times of emergency

- It also provides place-based intermediaries, who act to communicate and reconcile local resource and vulnerability issues between the community, government institutions and more distant external actors (e.g. NGOs and advocacy groups)[7].

However, linking social capital also has a 'dark side'. Buckland and Rahman (1999) describe a case where strong linking social capital led to discord and increased vulnerability to a flood hazard. Their research involved the study of three communities following the flooding of the Red River, North Dakota, in 1997. They found that whilst two of the communities responded to an 'insensitive', mandatory evacuation order implemented by the authorities, the residents of the most affluent community, 'Rosenort', developed a degree of discord against the order. This resulted in over 100 people remaining in the 'danger' zone during the period of highest risk. Buckland and Rahman (*ibid.*) suggest that this example illustrates that social capital wields a double-edged sword, i.e. it can foster co-operation by exploiting pre-existing networks and power relationships, but, it can also lead to conflict in decision-making within communities perceived to have a flatter social structure; where the pre-eminence of authority figures linked into the decision-making process is more likely to be questioned.

Whilst the dissent identified in this example is acknowledged, it can also be pointed out that more humble social networks did greatly enhance the efficacy of the

[7] *NB.* This could be viewed as an example of Coleman's authority transference (Table 3.1).

responses undertaken within the other two communities. However, a problem illustrated here lay in the fact that the emergency-management organisations are often incapable of accommodating the knowledge inhered within local networks into their 'command and control' derived evacuation strategies (Alexander, 2002; Dynes, 2006). Subsequent consultation exercises within the affected communities have sought to utilise these networks more effectively in preparation for future events. Accordingly, by using reiterative participatory techniques in these processes, it has been possible to formulate a much greater reflexivity and reflection of public opinion into the final recommendations made to the top-tier flood management policy makers (Haque *et al.*, 2002).

From a participatory risk-governance perspective, Pelling (2003) points out that 'linking' is the type of networking most often utilised within decision-making processes related to community sustainability and resilience building. Whilst this is problematic, as these networks can be exclusive of vulnerable groups, the creation of network linkages is regarded to have resulted in pragmatic and realistic participatory risk governance (e.g. Pearce, 2003). This, however, is where Pelling's caution about understanding what type of networks are being used, and what kinds of trust is being engendered becomes relevant (Section 3.2.2). If linking networks are being formally developed as a mechanism to encourage community empowerment, then it needs to be tacit within the process that all risk management options were genuinely deliberated between parties with mutual respect (O'Riordan & Ward, 1997). This avoids the public being lulled into formulating false hopes about impossible alternatives which are not 'on the table'. This is important, because, linking and empowering communities to engage in what are only, in effect, manipulative processes (Arnstein, 1971), has the potential to seriously backfire. As Szerszynski (1999) points out, trust is '*actively*' utilised by parties within decision-making hierarchies. This means that, what initially appears as a trusting public / authority

relationship can rapidly transmogrify into one of belligerent conflict if the public feel themselves to have been exploited. Ironically, in some cases there would be potential for the belligerence to be enhanced by the renitent effect of social networks – whose formation was, a little ironically, an intentional artefact of the process itself – reorientating their efforts against the now-proven '**un**trustworthy' coordinating authority (*ibid.*). Such a need for propriety in determining how the community are engaged also occurs, regardless, that progress toward any defined goals would, inevitably, be obstructed, obscured or mutated by the intrusion into the process of multifarious other economic, political and value-related factors (Few *et al.*, 2007). Factors, of course that would include the truism, that local opinion is likely to be "*neither coherent nor consistent"* (O'Riordan & Ward, 1997: p.267)

An example of challenges that have occurred in a UK coastal context, relate to the issue of managed realignment. In this case a problem has been identified whereby communities have been expected to accept scientific information, which suggests that they will lose their homes to unmitigated coastal erosion and inundation. However, at the same time there has been a side-stepping by the formal stakeholders of the fact that the public feel that they are being treated inequitably. As this public sees it, the most important aspect of any adaptive-management strategy would be for them to be compensated for any losses that they feel they are being 'made' to suffer. However, this measure has only been discussed peripherally (Barkham, 2008; Brennan, 2007; O'Riordan *et al.*, 2006) and what has resulted is an intransigent locally coordinated protest (CCAG, 2008). More positively, Harries and Borrows (2007) describe a participatory process that occurred some distance along the same coastline. Here, the Environment Agency purposefully engaged the "*principal protagonists*" against a realignment project and, through patient dialogue with these actors, built a level of trust that allowed the local community to accept the reality of their particular situation; for which there was **no** perfect solution.

Challenges clearly do exist in linking social networks into decision-making fora. However, from an environmental-hazards perspective, such networking can result in a broader consensus on what constitutes community resilience and what actions are needed, and by whom, in order to achieve effective community emergency management:

> "In this respect, the role of municipal-level emergency managers is particularly important in providing opportunities for community members to learn more about the hazards prevalent in that locality and in fostering the social capital bonds that contribute to resiliency." Murphy (2007: p.313)

The aspirations and aims that imbue such processes are, therefore, considered to be more likely inclusive, educative, reflexive and reflective of most levels of the greater community's networked hierarchy. These are positive attributes considering that inclusion and participation are two of the cornerstones of sustainability (Dalal-Clayton & Bass, 2002).

3.4 Investigating community resilience from a social capital perspective: the implications and challenges for this project

By identifying social capital's function, as a tool to enable collective action and by splitting the concept into its three principal components (trust, reciprocity and networks), a useful means has now been identified with which to investigate social network effects on community flood-resilience. Whilst finding evidence of shared risk perceptions is of value (Chapter 2), it is how these perceptions, and the risk responses they generate, are affected by network norms **and** network associations that are of particular interest (Walker *et al.*, 2006). Dynes (2005), has used social capital as a framework to illustrate the importance of the concept as a tool, with which to interpret the responsive actions of individuals and networks during and after disasters. This research will now use a similar conceptual framework to determine whether social networks and norms operate to influence the perceptions and

responses of coastal communities that are exposed, but not recently impacted, by an extreme flood hazard.

Chapter 4 now introduces the research methods utilised in this investigation.

4 Methods

4.1 Introduction

The fundamental physical processes and effects of flooding in the UK have been observed, empirically recorded and reported for centuries (e.g. Galloway & Potts, 2007; Doe, 2006) and the reality of the situation is that in many respects these processes and effects are understood (Knighton, 1998; Institute of Hydrology, 1999). Accordingly, if the world were **ideal** then, *ceteris paribus,* as a society we would be capable of reducing our exposure to flooding to such an extent that the severe consequences of these hazard events could be virtually eliminated. That this is self-evidently not the case indicates the inherent complexity of both historical and contemporary societies' relationship with flood hazards. It is the fact that all other things are **not** equal that has compelled an increasing requirement for society to make what White (1945) termed 'adjustments', in order that it can maintain or increase its occupation of areas exposed to either fluvial (*ibid.*) or coastal (Burton & Kates, 1964) flood hazards.

This project seeks to investigate certain aspects of the complexity of this society/hazard relationship; specifically in respect to low-probability coastal flood hazards. In doing so the importance of implementing a methodology that acknowledges the range of the institutions, percepts, concepts, values and norms that influence the hazard-exposed population cannot be understated (Hewitt, 1997; Wisner *et al.*, 2004). This is because, whilst it is important to determine how widespread perceptions and behavioural practices are, it is equally as important to identify the underlying causes of these phenomena (Hoggart *et al.*, 2002; Sayer, 2000). Accordingly, this chapter will describe how a mix of quantitative and qualitative methods was implemented, in order to satisfy these extensive and intensive research requirements as effectively as possible.

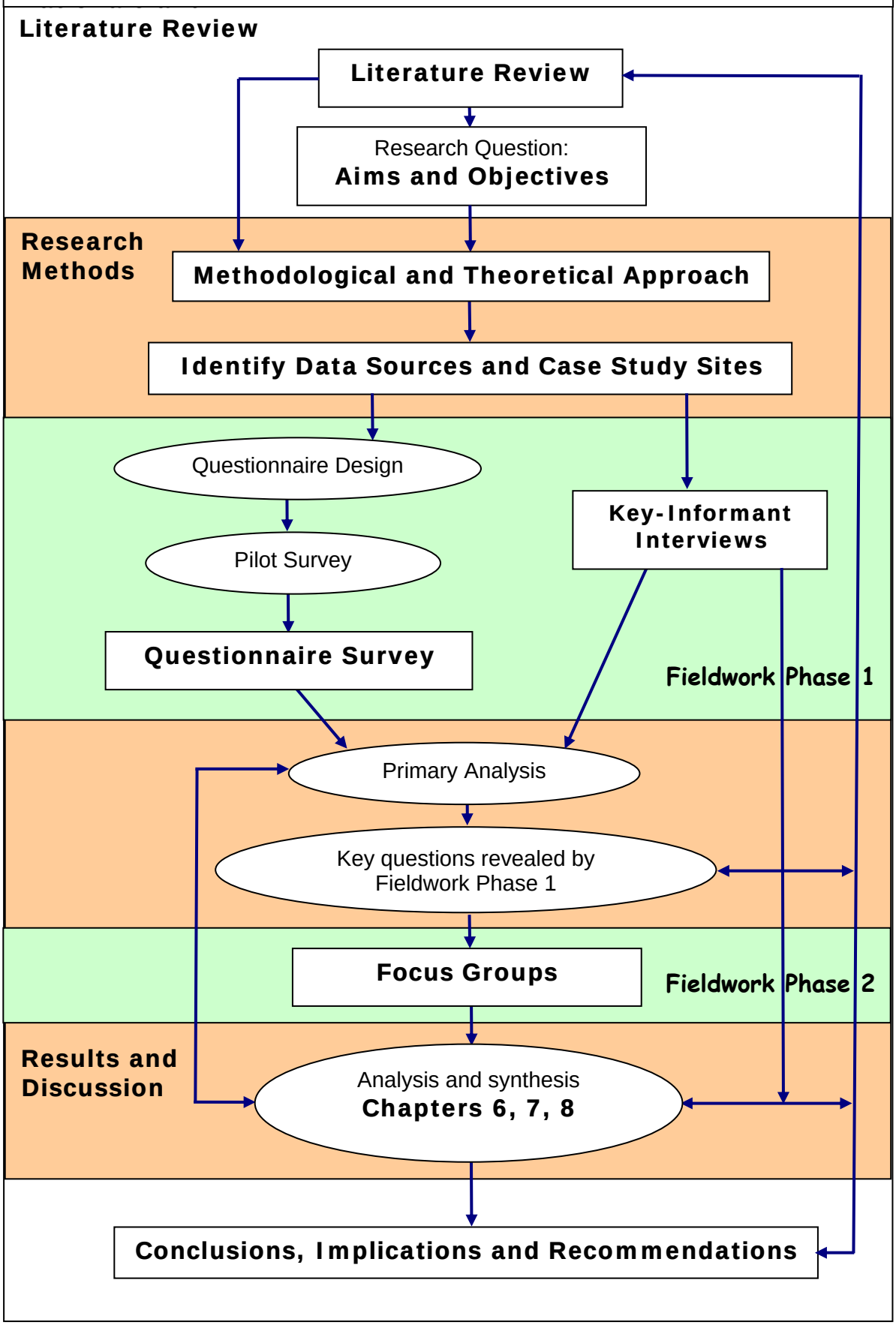
4.2 Framework of methods

In order to meet the objectives detailed in Section 1.3 and, ultimately, to achieve the research aim, it was essential to have a framework that guided progress through the project (Phillips & Pugh, 1994; Robson, 2005). Figure 4.1 illustrates the framework of methods as it nests within the overall research design that was introduced in Chapter 1 (Figure 1.4). The flow of the framework commences with the identification of the project aim, which was formulated after a substantial literature review identified gaps in knowledge. Once this aim had been identified and objectives detailed, then the methodological approach was determined. In this case it was decided that a mixed-method approach would be most appropriate (see Section 1.2). Using mixed methods has the potential to introduce many interesting challenges to a project. For example, the requirement for different datasets to be explored using quantitative and qualitative analytical techniques can lead to the creation of complexity, as the interrelating effects of different phenomena are revealed at different scales (Robson, 2005). However, regarding the mixture of data types, sources and analyses, Hoggatt *et al.* (2002) suggest that the use of a variety of methods can be highly beneficial and represents what is termed *triangulation:*

> "The advantage of using complementary methods is that they enhance capacities for interpreting meaning and behaviour. This is because the insight gained can strengthen confidence in conclusions by providing multiple routes to the same result" (Hoggart *et al.*, 2002: p.67)

As discussed in Section 1.2, Clarke (2001) suggests that mixed methods and triangulation can be particularly effective in policy-oriented research. To pursue such an investigation, he suggests that quantitative techniques are employed first, in order to identify social phenomena at a macro scale (e.g. the prevalence of crime). Once these patterns have been identified, he prescribes that qualitative techniques should then be

Figure 4.1: Framework of Methods; set within the Research Design



used to illustrate the actual impacts of these phenomena on the lives of individuals or groups.

Thus, a broader understanding of the implications of implementing policy that might influence the phenomena (whether positively of negatively) can be revealed. It was, therefore, in order to achieve this broader understanding of flood risk that the realist approach of using mixed-methods was employed in this project.

Accordingly, it was decided that existing quantitative datasets would be utilised initially to identify suitable at-risk sample populations and case-study sites. Quantitative methods would also be used in the collection of data by way of a survey. Once these data had been collected, subjected to initial analysis and a broad understanding of phenomena revealed, the methods would change. From here, qualitative methods would be implemented in order to investigate these phenomena at a more subjective level and to reveal any conceptual depth that might underpin these quantitative analyses. In this instance focus groups were chosen as the most appropriate method of data collection. This was due to the fact that unlike one-to-one interviews the social interaction within a discussion group can act to increase the richness of information that participants provide. The use of social capital theory, to guide this aspect of the research also made focus groups appropriate, because dialogue between participants can reveal how (flood risk) issues are negotiated and normalised by individuals within a social setting (Reed & Roskell-Payton, 1997; Zeigler *et al.*, 1996). Analysis of both quantitative and qualitative data would be further contextualised by the data from the key-informant interviews. This data would serve to contextualise the research participants' expectations and perceptions of FRM practice, against what might actually be provided by organisations operating within formal institutions.

Whilst the framework appears as a unidirectional flowchart, researcher reflection and reflexivity were a vital component of the research process (Mauthner & Doucet, 2003). These processes, which were guided by the author himself, or through the input of supervisors, or as a result of knowledge gained during conferences or through interaction with other researchers, should be considered as inhered within the framework's inter-linkages. Understanding this, allows the reader to appreciate that the conclusions, implications and recommendations that finalise the thesis are not the result of a simple linear progression through the research stages, but of an iterative process of analysis, interpretation and contextualisation that went on throughout the data collection and analysis phases.

Having described the framework of methods that was used, the project's datasets and data sources can now be introduced in more detail.

4.3 Data sources

It is an axiom of scientific endeavour that research needs to be guided by existing knowledge (Gilbert, 2001). Therefore, the research questions were defined following a comprehensive investigation of a range of literature (detailed in Chapter 2 and 3). Subsequently, as the investigation progressed, an additional library of academic, grey, policy and public literature and a diversity of primary and secondary data was also required in order to identify sample populations and then to conduct the research itself.

4.3.1 Secondary data sources

Secondary data sources included census (CASWEB, 2005) and Index of Multiple Deprivation (ODPM, 2004) data at census ward and Super Output Area resolution. Existing analyses of these large datasets were also utilised. Both the nationally calculated '*Social Flood Vulnerability Index'* (SFVI) (Tapsell *et al.*, 2002) and Walker *et*

al.'s (2006) '*Addressing Environmental Inequalities'* flood-risk and deprivation analysis, proved invaluable in the identification and the macro-characterisation of the case-study towns. The investigation was further informed by the analysis of numerous strategy and policy documents, which provided the political and legislative context for the investigation. These documents included, for example, Strategic Flood Risk Assessments (SFRA) and Shoreline Management Plans (SMP).

Once the secondary data had been explored and the research question finalised the next step was to use this secondary data to identify suitable case-study sites.

4.3.1.1 Selecting case study sites

In researching suitable sites, it was decided that those in England should be selected in preference to those situated in the other countries that comprise the UK. This was not just because of travel-distance considerations, but because different legislation operates within the devolved administrations, e.g. spatial planning in relation to flood risk is regulated under different legislation in each country (Fay, 2006). Also, the Index of Multiple Deprivation dataset (ODPM, 2004) utilised by Walker *et al.* (2006) to identify deprivation patterns in areas prone to flooding and the census data used by Tapsell *et al*. (2002) to create the Social Flood Vulnerability Index (SFVI), only related to England. This is not to say that research on societal vulnerability to flooding has not been carried out in the other countries (for example see: Werritty *et al.*, 2007) or that deprivation indices do not exist in these countries (WAG, 2005; Scottish-Executive, 2006; NISRA, 2005). However, the decision was made in order to avoid adding potential complexity to any analyses, through the introduction of transboundary legislative or data compatibility conflict.

With several million people residing on England's coastal floodplain (Evans *et al.*, 2004; Evans *et al.*, 2008), selecting a suitable sample was not straightforward. The work of Walker *et al*. (2006) and Tapsell *et al.* (2002) was important, because it would allow the selection of a population that exhibited the objectively defined characteristics of multiple deprivation and / or flood vulnerability. A second fundamental aspect of this project was, however, that the case-study sites should not have suffered significant flooding from the sea in recent years, but should have experienced such flooding during 'extreme'[1] events at some point within the last few decades.

The principal criteria for selecting a case-study site were, therefore:

- The population of the town should be considered 'vulnerable' to flooding
- The town should have been flooded by the sea, not recently but at least within the last few decades

In order to identify coastal populations that fitted the first criterion, two existing datasets were subjected to secondary analysis.

4.3.1.1.1 Addressing Environmental Inequalities: Flood Risk

This project was conceived as a direct result of the findings of research conducted by Walker *et al.* (2006) entitled *Addressing Environmental Inequalities: Flood Risk*. This team incorporated the English Index of Multiple Deprivation 2004 with the Environment Agency Flood Map (E.A., 2005) in order to suggest that deprived households in England are disproportionately represented within the coastal population exposed to sea-flood hazards. This finding sparked an interest in the author to find out more about this population, from the twin perspectives of risk perception and resilience. Whilst the nature of the IMD dataset did not lend itself perfectly to the investigation of these two

[1] See Section 1.4.1.2.1 for definition

concepts, the methods used by Walker *et al.* did provide a particularly useful foundation from which a more focused project could emerge.

To create their dataset, Walker *et al.* used the IMD 2004. This is an index comprising 37 indicators divided into seven domains (e.g. *income deprivation* or *health deprivation and disability*). Analysis of these data was carried out at census Super Output Area (SOA) resolution. This meant that deprivation 'scores' were calculated within each SOA for each indicator and then these scores were aggregated for each domain. Thus, each SOA in the country was attributed both an indicator and a domain score. These SOA scores were then combined with the Ordnance Survey's Address-Point® dataset. This resulted in every postcode address-point in the country being attributed the score for the SOA within which it was geographically positioned. This was the most precise method of attributing household deprivation that had been applied, to that point. This precision also made the next stage of the analysis particularly innovative. This is because, with the data situated within a GIS environment, it was then possible to overlay the address-point resolution data with the Environment Agency Flood Map. This resulted in a GIS map that showed with great precision[2], every address that stood on or off the modelled floodplain, along with its SOA deprivation score.

Walker *et al.* do justify their use of the IMD, as a means to illustrate the potential vulnerability of floodplain residents to flooding. However, they also suggest that the index "*can lead to a slightly confusing picture of deprivation*" (*ibid.* p.49), due to its combination of such a diverse set of indicator variables. As a means to make this project

[2] Regardless that the Environment Agency Flood Map appears so precise and yet is neither, necessarily, precise nor accurate (Porter, 2007), it is the fact that these properties fall within the zone delineated by that map that makes their use in this project relevant. That is, residents of these properties have access to images via the internet which indicate their exposure to a flood hazard (E.A. 2007a). Finding out, without prompting, whether or not participants in this project were aware of this fact and how they dealt with this information was an important part of the investigation.

more vulnerability specific, therefore, and in order to simplify the number of variables used to indicate 'vulnerability', this dataset became of secondary importance in locating case-study sites. Whilst the methods used by Walker *et al.* to spatially define populations were retained, Tapsell *et al.*'s SFVI became the central focus of this initial vulnerability analysis.

4.3.1.1.2 The Social Flood Vulnerability Index (SFVI)

The SFVI was created in 2002 by Tapsell *et al.* in order to provide a means to assess social flood vulnerability. The SFVI is an additive index that combines three social groups (the elderly over 74yrs; lone parents and the long-term sick), with just four indicators of financial deprivation (unemployment; household overcrowding; non-car ownership and non-home ownership)[3]. Following transformation the indicator scores are summed and the resulting dataset divided into quintiles. Therefore, once complete, the index defines a range of social vulnerability from very high (5) to very low (1). Whilst it was originally applied to the population at the level of the census enumeration district, the index has subsequently been updated to SOA resolution for use within the RASP decision-support framework (HR Wallingford, 2007) [4].

Due to Walker *et al.*'s use of the ArcGIS environment for their analysis, it was possible to directly import the HR Wallingford dataset into ArcGIS and to project the SFVI at the

[3] The reasoning behind the selection of these variables is detailed in the original paper (Tapsell *et al.*, 2002)

[4] One issue to consider in using data analysed at SOA resolution is that categories are averaged across each area, thus, the score may not be truly representative of the individuals living at each postcode address point. Therefore, noting the limitation of area-based studies known as the 'ecological fallacy' (Frankfort-Nachmias and Nachmias, 1996) the SFVI categorisation of each SOA should not be understood as an accurate indicator of the vulnerability of the occupants of each individual address-point. Individual households within each SOA could be more or less vulnerable than the applied category suggests. The categorisation is, therefore, merely a statistical measure of a group of people that quantifies a concentration of particular traits, rather than the range of them (Walker *et al.*, 2006).

same address-point resolution as the IMD. Again, this facility allowed those properties situated within Flood Zone 3 to be identified with relative precision.

Once the two datasets were loaded into ArcGIS they were overlain with the Environment Agency Flood Zone 3. This flood zone defines the area exposed to fluvial flooding with a 1% probability and sea flooding with a 0.5% probability. Developments within this zone are, therefore, considered to be at 'high risk' (E.A., 2008).

With the three datasets now loaded into GIS, the deprivation, flood vulnerability and hazard exposure of every coastal town in the country could now be assessed. A further stage of investigation was, however, required in order to ascertain which towns fitted the second selection criterion that related to their previous flood history.

This process of review and final site selection will be described in more detail in Chapter 5. For now, however, this chapter will move on by describing the collection of primary data.

4.3.2 Primary data sources

Only after the case-study sites had been identified, through the investigation of secondary sources, was the collection of primary data possible. This data comprised three elements; (1) written responses to the questionnaire survey (2) taped records of the key-informant interviews and (3) taped records of the focus-group discussions. The survey responses were analysed using the SPSS statistical package (Section 4.8.1) and all recorded conversations and discussions were fully transcribed and analysed using the Atlas.ti© Qualitative Data Analysis (QDA) software (see Section 4.9.2). The description of the procedures adopted to collect and analyse the various primary data commences by detailing the development of the questionnaire survey.

4.4 The Questionnaire Survey

The survey comprised a series of stages, from the identification of the population to be surveyed through to the collation of survey responses. This procedure is broken down into seven sections and commences by describing the sampling frame.

4.4.1 The sampling frame

The development of a sampling frame for the survey was relatively straightforward, as it involved selecting those households that were spatially located within Flood Zone 3 (Section 4.3.1.1.2). Although in Mablethorpe this frame allowed for any residential dwelling in the town to be included in the sample, in the other towns particular areas were indicated as being inside this modelled inundation zone, whilst others fell outside it (see Chapter 5). Properties that included a ground and/or basement level were targeted, specifically because these are the properties most likely to be seriously affected by flooding (Johnson *et al.*, 2007).

Demographically, it was decided that adults over the age of 18 should be sampled, but this was not purely because of the ethical issues that are raised regarding research with children (Oppenheim, 2004). Rather, it meant that participants were more likely to be responsible for, if not the actual fabric of the property itself (i.e. just owners), then at least for significant amounts of sentimentally or financially 'valuable' personal possessions within the property (i.e. owners and/or tenants). In other words, adults are arguably the household members with the greatest capacity to initiate resilience measures and to understand why they are doing it, or why they are not. This decision should not detract from the acknowledgement that children do have influence in building household-resilience to disasters (Izadkhah & Hosseini, 2005; Ronan & Johnston, 2005), or that they can hold positions of disproportionate responsibility within certain households, for

example, when they are in a caring role (Thrush *et al.*, 2005). However, these very limitations, in children's ability to influence household resilience, did generate very useful discussion during the focus-group phase (Section 8.3.1.2).

Once the attributes of the sample population had been decided, the next step was to design the instrument that would be used for the survey-data collection.

4.4.2 Questionnaire design

The design of the questionnaire was particularly important, because as a data-collection tool it would only be effective if people actually felt interested enough to complete it. This meant that the subject matter needed to be interesting and the content had to be easily readable. The question sequences had to flow naturally and both the questions and the response requirements had to be understandable and easily interpreted, without being confusing or overly intrusive (Foddy, 2003).

Engaging participants with the survey required the preparation of a front sheet, which described the project and indicated the importance of individuals' contributions to it. This page was written in the 'first person' in an attempt to impress on the respondent that involvement in the survey was valuable to her/his 'community' (*ibid.*). That the project findings would be useful to the authorities in other coastal towns was also highlighted, as was the promise of confidentiality in the handling of personal data. In relation to the minutiae of formatting the document, Comic Sans font was used throughout, as this is regarded by those who suffer from dyslexia as being one of the most easily legible fonts (BDS, 2007)

Where possible, questions were personalised (e.g. "How would [X] affect **you**?"). This was done specifically in order that the respondent would understand themselves to be

the ‘risk target’ (Sjöberg, 2001). Primarily this rhetorical device was used to reduce the tendency for the respondents to employ an *optimistic bias* in their responses (i.e. where an individual attributes less risk to themselves than they ascribe to the ‘average’ person, see Section 2.1.3.1).

Guiding respondents through a questionnaire is best achieved by way of sequencing the items into modules, with each sequence relating to a particular topic (Oppenheim, 2004); this gives the appearance of sensibility and order. Accordingly, Table 4.1 shows the format of the five question macro-modules (for the sub-module breakdown see section 4.6.4).

Table 4.1: Questionnaire: Topic modules	Number of items in module
Environmental concern	1
Flooding and climate change	34
Social Capital	6
Demographic characteristics	15
Personal details and comments	2

The issue of whether to use closed or open questions in the questionnaire was fundamental to how useful the data was to be. Closed or ‘forced-choice’ questions require participants to answer from a list of options that have been supplied by the researcher. Open questions allow the participant to produce his/her own response (Foddy, 2003; Simmons, 2001). Of the two types, closed questions have been suggested by some to be empirical tools, used predominantly by researchers who are keen to pursue results in the same fashion as physical scientists (Foddy, 2003):

> "[The researchers] have typically proceeded with the positivistic orientation that they are either discovering or describing an 'objective', 'real' world 'out there' and that their measures have 'true' values. To this end they have typically employed a stimulus-response model that assumes that each question is understood in the same way by all the respondents." (*ibid.* p.12)

In flood research, however, a particular limitation of closed questioning has been identified. After re-analysing data obtained for the Environment Agency by the British Market Research Bureau, and after using their own prompted (closed) and un-prompted (open) questions in interviews, Fielding *et al.* (2007) found that offering a list of potential alternatives significantly influences the way that questions are answered:

> "Results demonstrate that respondents reported a greater number of actions, and an earlier response in terms of warning level, once they had been prompted by the list of actions." Fielding *et al.* (2007: p.68)

An example of this problem was discovered personally by the author during his attendance at a conference. In one particular presentation the speaker had described a series of survey results, which showed that a high proportion of respondents had indicated that they would be prepared to fit removable barriers (flood-boards) to their properties in order to mitigate their hazard vulnerability. Intrigued by this high response rate, for what can be an expensive damage mitigation option (Crichton, 2003), the author later expressed surprise at this statistic to the speaker and asked her opinion as to why respondents had not opted for the usual alternative of 'sandbags'. The reply was, that as sandbags are regarded as being of such extremely limited value in reducing flood damage (Reeve, 2003), they had not been offered as a choice on the questionnaire; whereas the option of 'removable barriers' had. Such an example illustrates what Oppenheim (2004) describes as the 'direction' of the respondent toward a more 'desired' result. Had the option of 'sandbags' been prompted it could be suggested that this option would likely have been chosen in preference to the other, more expensive and less familiar, alternatives (Harries & Borrows, 2007).

Whilst closed questions can be very useful in determining certain types of response, 'directing' respondents can result in misleading data. This occurs, not only in the responses to that particular question but also because of the effect that it may induce on responses to the questions that follow i.e. respondents may have been presented with possible options which provoke trains of thought which might not otherwise have occurred to them (Oppenheim, 2004). In view of these issues, Fielding *et al*. (2007) made an explicit recommendation that those researching the social aspects of flooding should be prepared to adopt a more open, unprompted, questioning style:

> "The increase in both number and type of responses that appeared once participants were presented with a list of possible actions is likely to confound the proper understanding of public response to flood warning. Since people faced with impending flood may well have no such list to hand, it is suggested that in future surveys a more realistic assessment of possible response would be gained by seeking answers only to unprompted questions or scenarios." Fielding *et al.* (2007: p.92)

From the survey's inception, it was always the intention of the author to use open questions where an understanding was sought as to the personal knowledge, or the perceptions, respondents had of particular objective factors, e.g. does the respondent actually know three actions that s/he can take to mitigate flood damage to his/her property in response to the receipt of a flood warning?[5]

The use of closed questions was, however, not entirely inappropriate in this investigation. Not only are categorical responses necessary for some questions (e.g. age; gender) but attitudinal scales and ranking questions are also very useful for identifying particular perceptions that might be shared across the sample. For example,

[5] From an analytical perspective, Bryman (2006) points out that whilst open questions can provide a wide diversity of responses it should be remembered that if coding and a statistical software package are being used to perform analyses then these responses should be regarded simply as unstructured data and the analyses still as quantitative rather than qualitative in nature. It is only when such techniques as conversation analysis are employed that the results can be regarded as truly qualitative.

questions that require a respondent to rate their agreement with a statement on a semantic-differential scale are popular, because they can be considered easy and fun to complete (Oppenheim, 2004). This survey employed two such question series. These question series were not, however, intended to quantify respondents' attitudes through a summative analysis *per se,* as could be achieved with, for example a Likert scale (Robson, 2005), but merely to assess their opinions in relation to a particular discrete statement. Had the intention been to create an 'attitude scoring' system, with the capacity to differentiate amongst individuals, then considerable time would have been spent systematically collating and testing a large number of question items, so as to ensure the internal consistency of the measuring instrument. In effect, to be valid, a scale necessitates that items relate to each other in a unified way and that each item scale requires an 'equality of interval', both within itself and between itself and other items (e.g. does indicating 'strongly disagree' in respect to a particular issue mean the same thing for each respondent?). Instruments such as Likert attitude scales require significant amounts of development and a series of 20-30 items to be used in the questionnaire (Robson, 2005). For this research, gauging the respondents' attitudes in relation to flooding and climate change was a secondary consideration to the investigation of their resilience and social capital. Therefore, the differential-scale items were simply used to inform the investigation of these concepts. This meant, importantly, that the questionnaire maintained its relatively short length, whilst also including question items covering a broad range of topics.

One important aspect of the scaled questions was the 'Don't know' option. Including such an option has been suggested to result in the loss of useful data, because the respondent is able to take this 'easiest' option in any situation where s/he does not feel s/he knows sufficient about a topic to comment. However, Foddy (2003) suggests that

its incorporation allows genuine attitudes to be recorded on the scale rather than the researcher being left with a number of missing or 'forced' values.

It is important that the answers to survey questions are valid and comparable. In effect, the responses need to relate to the question that the researcher is asking, and ideally the respondents must understand the question in the same way (Foddy, 2003). One way to ensure that responses are comparable and valid is to use previously tested question items (Hoggart *et al*., 2002). For this particular survey many of the questions related to non-general issues and concepts, thus necessitating the development of new questions. However, the items related to social capital had been previously tested in research on other projects (Stone, 2001), or they were taken from either the ESRC Question Bank archive (ESRC, 2007), or were recommended by the Office of National Statistics (Harper & Kelly, 2003). The fact that these items were used out of their original context was, however, an important reason for them to be tested again during a pilot survey.

Once the type of questions to be used had been decided, the next consideration was how the survey would be distributed.

4.4.3 The survey technique

The selection of survey technique was informed by the success of Bickerstaff (1999; 2003), who reported high response rates to a drop-and-return delivery method. This information was valuable, as the literature suggests that other methods of delivery can result in very poor response rates and strongly-biased sampling (Foddy, 2003; Oppenheim, 2004; Robson, 2005). Additionally, drop-and-return has a number of advantages over doorstep interviewing. Offering someone on their doorstep a questionnaire that can be filled in at a time convenient to them, rather than it needing to be completed there and then, reduces that individual's opportunity to decline involvement

due to other commitments (e.g. “Not now, I’m about to serve dinner”). The fact that the volunteer knows that the researcher will be returning for the completed questionnaire in (e.g.) 48 hours, also increases response rates over those expected if a postal delivery method is used (*ibid.*). In effect, the use of a deadline places an impetus on the respondent that they not allow the document to disappear uncompleted beneath a pile of other paperwork. Doorstep delivery was also particularly important in this case for another reason. As it was crucial that the sample was selected from the fraction of the towns’ populations residing on the floodplain, being able to traverse the town on foot with a street map overlain with the detail of the flood zone was relatively straightforward and allowed for the very accurate targeting of properties[6].

In an effort to achieve a ‘representativeness’ of the general population within the sample the drop-and-return technique was applied in a random-systematic manner (Robson, 2005; Arber, 2001). This simply meant that once a start point (a particular front door) in a street had been arbitrarily selected, then the next door to be knocked on would be that of the house three doors along. Using this method considerable distances were covered as, due to time and financial constraints, if nobody answered a particular door on the first visit then this house was left and the survey moved on to the next target property.

Supplementing the ‘return’ aspect of the method – whereby the author physically returned to collect the questionnaire two days after its delivery – was the use of a postal return option. If the individual had not completed the survey within the 48 hours then a postage paid envelope was left with them (or placed through the door if the person was out), in order that they could return the document in their own time. A first-class postage rate was deemed appropriate because it is suggested that this represents an extra indication to the participant of the ‘importance’ of the research (Oppenheim, 2004).

[6] See Section 4.3.1.1.1

Ultimately, seventy four (21.6%) of the 343 questionnaires completed in the final survey were returned by post.

Once the questionnaire had been drafted and before the final survey was undertaken, it was important to test the decisions that had been made. Data collection is time and resource intensive, as well as being one of the most costly aspects of the project. It was, therefore, important to know that the selected strategy 'worked' in order to avoid, or at least minimise unnecessary costs, delays and frustrations.

4.4.4 Pilot survey

A small pilot survey was undertaken in the Bare ward of Morecambe during September 2006. This pilot tested the questionnaire format and also the delivery method. In all, twenty six questionnaires were delivered, in the random-systematic manner, to houses situated on the floodplain within a single census Super Output Area. The document was delivered on a weekday evening and collected two days later. The response rate to this survey was 81%.

Although in most cases the respondents answered all the question items, verbal comments made whilst the document was being collected did indicate potential problems with the repetitiveness of the initial format. Respondents also expressed concern over one particular money-focused question, which asked from how many people in their street they would be prepared to borrow £5. Although this is a recognised and tested item (Harper & Kelly, 2003), which investigates respondents' willingness to enter particularised reciprocal social arrangements, it was pointed out that a flood-focused survey was not the place to ask such a question. The sensitivity of proposed topics is not necessarily obvious at the outset of a questionnaire's design process (Oppenheim, 2004). So, finding such an adverse reaction to a specific item during this project's pilot

phase proved the importance of the trial (Foddy, 2003). Having identified the negativity surrounding the item it was easily substituted for another which investigated the same concept in a less sensitive manner.

Further changes were made to the layout and structure of the questionnaire after this pilot and the revised document was subjected to a second, small, e-pilot. The responses to this allowed for the final clarification of the format and item wording. Despite this iterative and time consuming approach to the questionnaire design, a single question item (Q.12g) was still criticised as being 'double-barrelled' (apparently asking two possibly contradictory questions instead of one) by two respondents in the final survey. This was a frustrating but important learning point and it reduced the author's confidence in the validity of the other responses to it. As a result the question was not used to build theory during the analysis phase.

4.4.5 The final questionnaire layout

The final questionnaire comprised a sequence of eight question sub-modules, which were themselves set within the 4 macro subject modules detailed in Table 4.1(refer to Appendix 1).

4.4.5.1 Section 1: Attitude scale (Q. 1)

The first question in the final document is used to gauge the respondent's level of concern toward flooding as compared to a number of other local environmental issues.

4.4.5.2 Section 2: The Media (Q2a-c)

These are three questions to evaluate the respondent's exposure, through the media, to the effects and impacts of flooding. The first question is not situated, in that it asks whether **any** flooding coverage has been seen in the media. The supplementary

questions are, however, localised and personalised in that they ask the respondent to state whether personal understanding of how flooding could affect **him/her** has been changed by this media coverage; through this approach the respondent is made aware that s/he is the 'risk target' (see Section 4.6.1).

4.4.5.3 Section 3: In/formal communication (Q3a-4d)

This is a series of six questions to evaluate whether the respondent has spoken formally or informally about **local** flooding issues in the previous 12 months. These questions identify the respondent's capacity and willingness to engage with the issue through hierarchical, linking networks (e.g. formal institutions), or whether they just speak within informal bonded or bridged networks (Section 3.2). By this means, the trusted sources of information capable of influencing the respondent's risk perceptions and understandings are identified.

4.4.5.4 Section 4: Flood experience, sources and responses (Q5-11b)

This was a series of ten questions that explored the foundations of the respondent's risk perceptions. These questions relate to…

1) Experience of flooding
2) Potential local sources of flooding
3) Perception of flood likelihood
4) Knowledge of flood warnings and flood warning systems and their perceived personal responses to those warnings
5) Suggestions as to how resilience could be built, against an imagined future flood event at household and community scales

4.4.5.5 Section 5: Semantic differential scales; flooding and climate change (Q12-15)

These two question series investigated the respondent's strength of feeling in relation to the issues of flooding and climate change. This is done through the use of provocative statements and scaled 'strongly agree' to 'strongly disagree' and 'don't know' response options (see Section 4.6.1). Two separate items are also included here. The first asks whether the respondent has an insurance policy covering for flood damage; this is an important objective indicator of resilience (Pelling, 2003). The second asks for the identity of the respondent's most trusted informal source of climate-change related information. Complementing the responses given to the items 3a-4d (Section 4.6.4.3) this question too is evaluating the role of particular informal social-network relationships in maintaining risk perceptions.

4.4.5.6 Section 6: Trust, reciprocity, social capital and community (Q16-21)

Harper and Kelly (2003), provide a core set of 16 survey questions, which they have constructed for use in computer assisted (CAPI) surveys. They suggest that these questions have been found to investigate most effectively the range of factors that constitute social capital. However, they also suggest that the format of these questions may not necessarily be compatible with all types of survey. Due to the flood-hazard focus of this questionnaire and the delivery method that was employed (and which ultimately proved so successful; see Section 4.4.7), the author considered that a compromise was important, between including a full compliment of social capital-orientated questions and keeping the questionnaire focussed, concise and engaging. For this reason, only a sub-set of six questions were used.

These six questions investigated the respondents':

1) Willingness to enter into local reciprocal arrangements
2) Personal conceptualisation as to what scale of social aggregation enspheres his/her 'community'
3) Feelings of social trust
4) Levels of engagement with activities involving:
    a. Informal social assistance (i.e. 'Good neighbourliness')
    b. Civic engagement
    c. Social Activity (Participation in group-based activity)

These items were chosen specifically in order to investigate what Stone (2001) suggests to be the most fundamental dimensions of social capital; trust, reciprocity and networks. However, this is not to say that this question set is the only one relevant to the investigation of this concept in the survey. Stone points out that if social capital is to be quantified then it is also important to investigate certain characteristics of these networks. From this perspective, the question items focussing on communication within social networks (Section 4.4.5.3) were also useful in furthering this aspect of the investigation (see Section 7.3.2.2).

4.4.5.7 Section 7: Socio-demographic characteristics (Q22-36)

This is a set of fifteen questions used to identify the respondent's socio-demographic characteristics. As well as the standard age and gender questions, there are also items which identify attributes used in the SFVI (Section 4.3.1.1.2), which were particularly relevant in the investigation of what constituted objectively defined vulnerability within the sample e.g. "Does a household member suffer from a long term limiting illness?"

4.4.5.8 Section 8: Final comments and identification details (voluntary)

The final page of the document provided space for the respondent to mention any particular points of personal interest or clarification in relation to the survey's subject matter. The opportunity was also given for respondents to volunteer their name and address details if they wished to take part in the next stage of the research, the focus group discussions.

4.4.6 Questionnaire administration

Whilst the use of drop-and-return was apparently justified by the high response rate (Section 4.5.6), it is acknowledged that the response rates that were ultimately achieved are perhaps not all they might seem; particularly from the perspective of achieving population representativeness. For example, time and financial constraints limited the opportunity to call at an address more than once, therefore, if a householder was out on this one occasion then that property was missed and another was selected. This is contrary to good practice, as it has the potential to introduce bias to the data, through allowing the possible under-representation of certain demographic groups (Flowerdew & Martin, 2005). The initial intention was to deliver the questionnaire between 18:00hrs and 20:00hrs in the evening in all three towns. This system would increase the likelihood that most people, whatever there circumstances, would be 'in' for the evening. This worked well in the first town sampled, Morecambe, with the main survey being conducted in January and February 2007, whilst evenings were long and dark and during a period of unsettled weather. However, during the first evening of delivery in Mablethorpe a problem was encountered. Using the same random-systematic delivery method, it was quickly realised that either the average age of this town's population was higher, or that their physical condition was poorer than in Morecambe – two impressions

that could have been anticipated given the case-study research (see Tables 5.2-5.4). The exquisite inappropriateness of continuing with this delivery method was revealed when householders started coming to their doors before 18:30hrs, already wearing their pyjamas. In the interests of being sensitive to people's modesty and privacy, this situation meant that the remaining deliveries and collections were commenced earlier in the afternoon. Whilst this change may have resulted in less embarrassment to the author and reduced animosity from householders, its effect in limiting the number of households of 'working' people that were sampled (people who would have been out of the house at this earlier hour) cannot be quantified.

Personal delivery had other drawbacks too. From a health and safety perspective, several factors made the process particularly challenging; despite a risk assessment having been submitted and approved. For one, delivering the questionnaires in darkness caused some personal safety concerns; as might have been predicted by Flowerdew and Martin (2005). As acknowledged later (see Section 5.4.1), the West East of Morecambe has a reputation for being quite 'rough' and this 'roughness' was actually quite tangible to the author throughout the period of fieldwork. In effect, this made the area into perhaps what Belousov *et al.* (2007: p.170) might term, if not a "*risk-saturated space*", then at least a "*problematic research setting*". Nothing substantive occurred to instantiate these concerns, but the experience provided validation for the fact that the author had arranged a 'check-in' system with a next of kin as a safety precaution (*ibid.*).

The issue in Mablethorpe was somewhat different; here the concern was meteorological rather than sociological. During one particularly windy and wet afternoon the author was first struck on the head by a large lump of flying polystyrene (with no injury) and then later, unbalanced and blown several feet from where he stood at a house door, whilst wrestling to calmly present the resident with a crazily flapping multi-page questionnaire.

Although, risky in retrospect this particular incident had a very informative outcome as, once the author had gathered his wits and composure, the first thing the householder said to him was:

> "This is nothing dear, on the day of the flood in 1953 the wind wasn't just gusting to that speed, it was constant like it…all day"

This was an example of an important and positive aspect of delivering the questionnaire personally. On several occasions, after hearing the author's 'delivery spiel', individuals spontaneously recounted stories of their personal experience of flooding, either in the town or elsewhere. Even though some of these people declined to take part in the survey itself (e.g. "I'm too old to be bothered with that sort of thing") the extra contextualisation that these encounters added to the author's understanding of the personal experience of flooding was enlightening.

4.4.7 Survey response rate

Once the final questionnaire (Appendix 1) was agreed, a total of three weeks was spent delivering 450 copies of the twelve page document around the three sample areas. Table 4.2 shows the response rates that were achieved.

Town	Delivered	Returned	% return for town	% representation in full sample
Mablethorpe	150	121	80.7	35.3
Cleveleys	150	124	82.7	36.2
Morecambe	150	98	65.3	28.6
Total	450	343	76.2	100.0

Table 4.2: Questionnaire- survey response rates

The overall response rate of 76.2% indicates that the drop-and-return method proved itself to be very successful, in contrast to what might have been expected from a postal

delivery, as Simmons (2001) suggests that a ~20% response can be all that is achieved from many such surveys. However, the high mean response to this survey does obscure the fact that the response rate in Morecambe was considerably lower than in the other towns. This particular discrepancy is discussed in Section 7.2.

Once completed, the survey resulted in the collection of a substantial empirical dataset that could be analysed using predominantly quantitative techniques. This provided a breadth to the research and the possibility to compare, contrast and interpret patterns in the data. The next phase of data collection would involve the collection of qualitative data with which to explore phenomena to a greater depth.

4.5 Focus-group discussions

Focus groups provide different data than do individual interviews i.e. they provide another perspective on a particular issue; **not** a truer or better perspective (Robson, 2005). Whilst individual interviews would have revealed an individual's own perceptions and understandings of particular issues (in this case the implications of flood hazard), it is suggested that a group context can provoke both spontaneity and candour, which in turn make individuals' contributions to the discussion richer (Reed & Roskell-Payton, 1997). The discursive interactions can also help illustrate how such meetings can be regarded by individuals as a forum for personal learning:

> Group discussion can provide a perspective that transcends individuals' contexts and transforms personal troubles into public issues. This can foster collective identity and initiate community contact. Such groups can be consciousness-raising. (Hoggart *et al.*, 2002: p.233)

However, whilst these groups no more present facts about the world than do other methods, Reed and Roskell-Payton (1997), argue that their validity lies in the understanding of them as being a means to display a group perspective, which is

negotiated and developed between particular sets of people. The groups' essence is, therefore, as Thomas *et al.* (1992) suggest:

> "… not [as] a collection of individual interviews. It is a single entity in its own right. The structure and content of [which] may vary considerably from one focus group to the next because of the unique dynamics of that specific group interaction." (*ibid.*: p.11)

In relation to the use of focus groups as a means to investigate the social issues surrounding natural hazards, Zeigler *et al.* (1996) further, suggest that:

> "…their ability to incorporate context and define emergency norms, their open-ended, guided-discussion format, and their ability to derive qualitative insights make focus groups especially valuable in hazards research" (Zeigler *et al.*, 1996: p.124)

Taking these suggestions into consideration, focus-group discussions were viewed as a more appropriate tool, than one-to-one interviews, with which to investigate further the opinions and perceptions that respondents had indicated in their submissions to the questionnaire survey. Specifically, the group-discussion format was considered useful, as a potential means to test how the participating respondents' opinions and perceptions were influenced when subjected to peer-to-peer debate. In effect, the process was used to reorientate the research perspective away from the individual, toward the investigation of collective opinion (Robson, 2005). The intention being that in employing focus group techniques, effectively, there would be a cross fertilisation of ideas between participants, which would give an insight into how particular hazard-related issues are explored, restricted, treated as incontrovertible or described through consensus (Catterall & Maclaran, 1997; Reed & Roskell-Payton, 1997). Indeed, throughout the analysis chapters that follow, segments of focus-group derived conversation are used to illustrate concepts and phenomena. Sometimes single speakers are quoted. This occurs where statements are made that sum up in some way what appears to be a consensus position

on a particular matter. At other times, however, strings of discussion are used to illustrate more effectively, where opinions or attitudes diverge from consensus and show the range and sometimes the strength of individuals' positions regarding particular phenomena.

4.5.1 Recruitment strategy

In order to run a successful focus group it is necessary to recruit willing volunteers. It is also important that these volunteers have been suitably screened in order that they possess the characteristics that define the particular traits that one wishes to investigate (Krueger & Casey, 2000). For example, the literature suggests that in relation to hazards, women hold higher risk perceptions than men (Section 2.2.1). Accordingly, if one wishes to gauge the range of risk perceptions in a sample population then one should recruit both male and female participants. However, whilst the creation of demographic screens is relatively straightforward, Krueger and Casey suggest that care should be taken when screening is undertaken through "*non-observable factors such as attitudes, opinions or values"* (*ibid.*: p.79), unless one is using non-biased empirical data to create a screening framework.

It was anticipated that willing participants would be initially recruited to this phase of the research through a process of self-selection. As described in Section 4.4.5.8, the questionnaire was used to facilitate this, by offering respondents the opportunity to provide their contact details. Once the contact details had been obtained, the intention was to recruit sufficient participants to run two groups in each town, with each group comprising participants within a relatively homogeneous age range.

Conducting a single discussion with any single-characteristic group (e.g. age, gender) will never allow the full range of opinions and attitudes that such a homogenous social

group may hold to be identified (*ibid.*). However, given the financial constraints, the division of the groups in such a way was thought to at least offer some potential to compare age-group perspectives during later analyses (see Section 3.2.2 for a discussion on the relative perceptions of age-defined cohorts).

In total 139:343 (40.5%) of the respondents from the three towns provided contact details. Unfortunately, however, as the recruitment phase progressed it became clear that it was going to be hard to implement too restrictive a sampling screen. In the end, only twenty four participants could be enticed to attend one of the two groups that were convened in each town. Section 4.5.3 will discuss the limitations that this low response placed on the research.

4.5.2 Topic rationale and procedure

The discussions were conceived as a means to collect data with which to complement those already obtained during the survey. Therefore, each discussion needed to be themed toward the investigation of the issues that had been probed by the survey instrument. In addition to this and in the interests of maintaining a structure that would make analysis and cross-comparisons more straightforward, each discussion was ordered in the same way (Krueger & Casey, 2000). Progress was guided by the moderator who, during the course of each discussion, passed three sheets of paper to the participants. Upon each sheet was written a series of questions or statements for the participants to read. These questions and statements sought, respectively, to stimulate the participants' thoughts and opinions on:

1. How s/he was 'positioned' in relation to one of three distinct quotations, which each revealed a particular perspective on flood risk

2. How resilient they considered their households and communities to be against flooding and how this resilience might be increased

3. How household and community preparedness might be improved by the implementation of particular actions by FRM organisations

The moderator guide and the three sets of statements are reproduced in Appendix 2.

It can be seen that the primary **focus** of the group discussions was on the investigation of the participants' perceptions and understandings of flood risk. From this it might be surmised that concepts, such as vulnerability and social capital, were not explicitly explored at all. This illustrates the element of compromise that was introduced during this phase of data collection and which is part of the focus-group process (Cronin, 2001). From the outset, the participants had known that the topic of discussion was to be flood risk. Accordingly, the three discussion phases were developed in order to investigate three different aspects of this concept. Such a focus provided a natural direction to the flow of each discussion. This is because the conversations were never stilted by the sudden introduction, by the moderator, of subjects that might be perceived as being somewhat abstract to this principal theme. For example, participants may have been confused, during a discussion about sea defences, to be presented with a sheet that asked how often they spoke to their neighbours. That questions such as these were not asked explicitly as part of the formal structure does not, however, mean that these topics were not investigated during the discussions.

In effect, the guide only acted as a framework to introduce the different aspects of flood risk to be investigated. However, the very act of engaging in discussion around these topics encouraged participants to add specificity and personal context to their contributions. In each case, such contextualisation inevitably led to these individuals covering the wider issues of vulnerability and 'social capital', either by themselves or as a

result of low-level prompting by the moderator. Whether the participants appreciated that this was happening is not the point. The point is that, due to the fact that the conversations quite naturally expanded from the narrow focus of the phased questions, a much greater richness of data and depth of understanding was achieved than would be imagined by just a cursory examination of the topic guide.

4.5.3 Limitations of focus groups

Hopkins (2007) suggests that focus groups are an important and yet currently under-utilised source of data in the investigation of human geography. However, whilst being seen as valuable in qualitative research, in that they can reveal the 'broad strands of a problem', Burgess *et al.* (1988) suggest that once-only focus groups are quite limiting, and suggest that with their…

> "…directed leadership and reliance on stimulus materials, [they are] not the most appropriate method of exploring environmental values which are deeply held and which clearly reflect a complex interpenetration of individual experiences and collective beliefs about nature, landscape and society." (*ibid.*: p.311)

In suggesting this Burgess *et al.* are expressing their opinion that meeting with groups more than once can have significant benefits over single meetings. This is due to the greater depth of trust and understanding that tends to surface in these in-depth groups. They allow individuals to become more familiar with other group members and this can make them less reticent in revealing their more honestly held thoughts and beliefs about sensitive issues (Burgess *et al.*, 1988; Burningham & Thrush, 2001a; Thrush *et al.*, 2005). The very nature of one-off focus groups has also been suggested to open any data resulting from them to calls of idiosyncrasy. Furthermore, there are no available mechanisms to establish whether it can or can not be so described (Reed & Roskell-Payton, 1997). However, although it is possible that allowing groups to meet twice may

well have added to the research findings, time and cost implications constrained the project to a single meeting of the six groups. The question in relation to the validity of the data resulting from focus groups will be discussed further in Section 4.7.2.

From a more logistical perspective, Krueger *et al*. (2001) lay out a whole chapter of advice in relation to recruiting focus-group participants. A broad range of issues are covered, such as the importance of making involvement sound interesting and rewarding, whether to offer incentives and ensuring that timely reminders are given to volunteers before the meeting. Even taking many of these suggestions into account the recruitment process is described as being potentially challenging.

The very fact that this research was investigating low-probability events, doubtless, had some influence on survey participants' unwillingness to volunteer for the discussions. Even though these events are associated with high risks to health and well-being, the very fact that they can be perceived as being unlikely to occur means that people can tend "*to focus attention and resources on hazards that are seen as more immediate and/or threatening*" (Shaw *et al.*, 2005: p.36, see also Slovic et al, 2000). In fact, despite the fact that people had already expressed an interest in participating – by completing the relevant section of the questionnaire survey – they still proved extremely reluctant to actually attend a discussion. In relation to flood risk Thrush *et al.* (2005), relate similar experience (of theirs) in finding it impossible to recruit participants from amongst one particular research sample whose members **had** been recently flooded:

> "[I]t proved impossible to recruit people in Stockbridge; this was explained by recruiters (all of whom had acted as key informants) as being due to a general lack of public interest, a reluctance to dwell upon a past traumatic event and a feeling that little would come of any further research involvement." (*ibid.*: p.6)

Despite offering a financial incentive to those participating in this project, numerous people even failed to show up 'on the night'. This factor resulted in the worst attendance

recorded, when only two people showed up in Cleveleys, out of five volunteers who had all expressed interest and keenness when telephoned only 24 hours before. In this particular case, proceeding with such a small group would have been regarded by some as little more than a dual-interview (e.g. Krueger & Casey, 2000). However, Longhurst (1996) does not regard these as "failed" focus-groups, particularly when a sensitive research topic (in her case, pregnancy) is being discussed. She expressly suggests that even two discussants can add alternative discourse to that which is retrievable if each individual were to be interviewed alone.

Focus-group attendance ranged from these two participants to six in number (Table 4.3). The small size of the groups did, on occasion, have the affect of stunting conversation. This meant that, as moderator, the author had to be conscious of the sporadic need in some discussions to feedback ideas and possible conversation flow-paths to the group, in order to keep the participants focused.

Town	Indicated interest		Actually participated		Participants in discussion group ***1***	Participants in discussion group ***2***
	f	%	*f*	%		
Mablethorpe	52	43	8	7	4 (+2*)	4 (+1*)
Cleveleys	52	42	6	5	2	4
Morecambe	35	36	7	7	3	4
Total (*n* = 343)	139	40	24	7	10	14

Table 4.3: Focus-group recruitment of questionnaire respondents, by frequency and percentage and by town and total
* denotes an accompanying spouse who fully contributed to the discussion

In suggesting that groups arranged for non-commercial research should be composed of between 6-8 individuals, Krueger and Casey (2001) are not only conscious of the fact that smaller mini-focus groups can not offer the range of material that larger groups can

introduce, but also that discussions in smaller groups can easily be monopolised, if dominant or verbose characters feel that they have greater experience than other participants (see also Wibeck *et al.*, 2007). The often self-appointed 'expert' status of these individuals', or their strength of opinion, can act to subdue quieter or more reflective group members and thus, restrict the negotiation of issues. Strong characters and talkative individuals were evident in several of the discussions and each provided the moderator with a particular dichotomy; whether to interrupt what might in some cases have been regarded as a speech more than an expressed opinion, or whether to let them proceed if what they were saying was of particular relevance to the topic thread. This challenge could best be described as having presented a 'learning experience' for the author, whose lessons will inform his future research.

As can be seen in Figure 4.3, group size was not the only issue. Of the twenty four participants, three individuals were not survey respondents in the true sense, but were in fact the spouse of a respondent. It could, therefore, be suggested that these individuals were not necessarily as independent as would have been ideal. Krueger and Casey (*ibid.*) suggest that the use of couples in focus groups can be limiting. Their experience being, that one partner tends to defer to a more talkative spouse, therefore, reducing the breadth of discussion. Krueger and Casey do, however, advocate that it should be up to the moderator, rather than the people involved, whether these 'new' individuals should be incorporated into the group or asked to wait outside. In the circumstances, the author felt that including these extra individuals provided sufficient potential benefit to the small group discussions that they were invited to participate. Having experienced and analysed the discussions it was found that there was little evidence of deferral between the couples who did take part (i.e. all spoke openly). These individual's opinions did, however, tend to mirror or support their respective partner's perspective. In hindsight,

the author has no regrets about including these uninvited individuals to participate, as their contributions often provided important clarifications (even if only of a 'couple's' perspective), or prompted further discussion through introducing a slightly different direction to the conversation.

As regards providing an incentive it was decided to offer cash as a way to both entice and remunerate participants. In most cases this gift was accepted with gratitude. However, on several occasions the money was politely declined with an acknowledgement that "*the money could be better spent by the university on something else*" or it was accepted expressly in order that it could be donated to a charitable organisation; either reason was interpreted by the author as a genuine indication of personal kindness and generosity.

The data collected during the survey and focus-group discussions constituted the publics' contribution to this research project. The final phase of data collection was intended to complement these public contributions by adding another perspective to the research. By interviewing key informants a better image of the role and capacities of the formal institutions of FRM could be ascertained.

4.6 Key-informant interviews

Insights from key informants can serve to complement and/or improve on broader based information gleaned through a review of the literature and serve to illustrate concepts and phenomena that otherwise would have only estimated site specificity (Burningham & Thrush, 2001b). Accordingly, the importance of gaining insight into the sample towns' flood preparedness from key informants was fuelled from two perspectives. Firstly, it was considered important to assess how low-probability / high-consequence flood hazards were engaged within the organisations and formal institutions responsible for

the safety of these populations. Secondly, it was also initially felt important to gauge the opinion of individuals holding public office, as to their understanding of the dominant social, environmental and economic issues affecting their respective constituencies.

The manner in which many public agencies and institutions respond to emergencies affecting the population has, since December 2004, been prescribed by the Civil Contingencies Act (2004). Individuals employed in particular roles within these agencies and institutions are, as a result, responsible for the maintenance of plans and for making arrangements for contingencies in anticipation of an emergency occurring. Such responsibilities include defining the arrangements to be made and the actions to be taken by the body, through its representatives or officers, during the preparation, response and recovery phases of the emergency, (HMG, 2005a; HMG, 2005b; HMG, 2006). Such planning, whilst essentially carried out on behalf of the public, cannot necessarily produce the tangible check-list of actions and support measures which 'the public' (as a collective of individuals and households) in an exposed area might anticipate (Alexander, 2002).

Speaking to key informants from the emergency planning and emergency response authorities allowed for the detail of these institutions' planned responses to an extreme event to be explained (Thrush ***et al.***, 2005). With an image of this 'story' recorded, it was then possible to compare public preconceptions of the degree of protection and assistance they imagined to be available, against the degree of protection and assistance that could or would actually be offered. However, whilst such a comparison achieves an important overview of how potential future events may play out, it should be noted that Clarke (1999) impresses that extreme events can reveal the shortcomings in many emergency plans; sometimes disastrously. He suggests that what is imagined, by both institutions and the public, to be available in such situations need not necessarily be

so. He points out explicitly that this can have far-reaching implications for the affected population after the event:

> "Publics are often baffled and angered when organisations seem incapable of adequate response. When the often substantial gaps between what organisations **say they can do** and what they **can actually do** become public, institutional legitimacy is threatened and the probability of popular distrust increases" (*ibid.*: p.170, emphasis in original)

Walker and Broderick (2006) also point to another factor which relates directly to the current role of formal agencies and institutions as laid out under the powers of the Civil Contingencies Act 2004. They point to the fact that within the current legislation there is an explicit focus on the resilience of public and, increasingly, private-sector institutions; whilst for the citizenry itself the appropriate strategy remains the command and control-oriented 'deficit model':

> "The public is ignored but will be told in a crisis that its role is to obey." (Walker & Broderick, 2006: p.296)

The authors suggest that this is evidence of a less than convincing undercurrent view persisting in this "*era of resilience*"…

> "…that trained officials know best and the duty of the public is to follow instructions rather than be trained to think for themselves." (*ibid.*: p.100)

By conducting interviews with individuals whose roles are specifically regulated by this legislation, the aim was to evaluate if such a legally structured concentration on institutional, rather than social, resilience was projected at the local scale, or whether more inclusive strategies were in place. In order to do this it was only necessary to speak to a small number of key individuals who had direct responsibility for the case-study towns, rather than to people whose responsibilities lay at a higher level.

4.6.1 Interviewee selection

Key informants fell into three main categories:

1. Local Authority Emergency Planners: Responsible for preparing and coordinating Local Authority emergency plans which explicate business continuity procedures and the hierarchy of responses undertaken by the authority's departments and officers during emergencies.
2. Environment Agency Flood Incident Managers: Responsible, with the assistance of other organisations (e.g. The Met Office; The National Tidal and Sea Level Facility (NTSLF)), for forecasting flood events, and for communicating hazard information to professional partners (e.g. Police, Local Authority) and the public; including the issuance of flood warnings.
3. Local Town Councillors: These are elected representatives of the 'community' who are engaged (through personal interest and their council activity) with the current issues of importance and/or public concern in the towns and their environs.

In selecting individuals holding these particular roles, the intention was to explore their understandings in relation to their institution's policies on emergency awareness and preparedness and also their impressions of the environmental, economic and social structure of the case-study populations themselves. Once potential participants were identified through a search of relevant websites, contact was made primarily through electronic communication or by telephone. The interviews took place in a number of venue types, from offices to home addresses and in one case, a golf club.

Ultimately seven individuals were interviewed from across the three targeted institutions (Table 4.4).

	Sample Town		
Key Informant	Cleveleys	Mablethorpe	Morecambe
Emergency Planning Officer	1*	2	1*
Environment Agency Flood Incident Manager	1	1	1
Town Councillor	0	1	0

Table 4.4: Key informants interviewed for each sample town.
*denotes single interview of Lancashire Emergency Planning Officer

4.6.2 Interview procedure

Each interview consisted of a number of stages. Initially, all individuals were asked to describe their role and their experience in post. Questions then diverged with further subject areas being covered in a slightly different order by the different actors. All informants were asked a series of questions about their knowledge and experience of flooding and the role of their agency or institution in preparing for and responding to flood events. Informants were also asked about their understanding of concepts such as vulnerability and resilience and how they personally applied these concepts, whilst carrying out their duties and in relation to describing their respective town.

Emergency Planners and Flood Incident Managers were asked specific questions in relation to the implementation of the Civil Contingencies Act 2004, the role of Local Resilience Fora and the methods of warning and informing the public employed in their particular area. The elected official was questioned more specifically in relation to the current status and future sustainability and development of his town and his institution's aspirations for it. The interviews were concluded with questions probing perceptions of whether flood warning could be improved and if so how, and whether or not the individual considered such improvement to be necessary or achievable. The topic

schedule used during the interview of the emergency planning officers in Mablethorpe is attached as an example in Appendix 3.

4.6.3 Limitations of key-informant interview procedure

Limitations were experienced in relation to the key-informant interviews. Emergency Planners and Environment Agency representatives made themselves available and provided valuable insight into the role and capabilities of their respective institutions. However, only a single elected representative (a Mablethorpe Town and District Councillor) volunteered to participate in a research interview. This was despite numerous attempts made via email and telephone to elicit the interest of other suitably qualified individuals in Cleveleys and Morecambe. Whilst it is only a perception that cannot be validated, the author's impression in relation to these communications was that these individuals did not consider their involvement in a project investigating 'such' a low-probability hazard to be worthwhile (from their perspective) when compared to their other commitments.

Whilst the final number of key-informant interviews was very small, the information they provided proved invaluable throughout the project's data analysis phase. This was because, although these individuals tended to speak from the perspective of their formal agency or organisational role (e.g. emergency planners spoke in line with CCA and Cabinet Office guidance), each also provided interesting personal examples of local challenges to working within such formal operational parameters (see Section 7.5.2.3). Whilst not exhaustive, these examples of the problems faced by people who are tasked with implementing effective resilience and response measures at a local scale, were very useful. Indeed they provided important corroboration for perceptions, which several respondents expressed, about how stretched formal responders are, in both potentially

achieving what they promise during any major emergency and in motivating the public to engage in risk mitigation practices themselves (see Section 8.4.2). In light of this apparent correlation, between the perspectives of the formal actors, the public and the literature in relation to these issues, it was considered that suitable saturation had been achieved and that the seven interviews were sufficient to provide suitable 'emergency planning' contextualisation within which analysis of the other data could progress.

With the quantitative and qualitative data collected the next stage of the project involved data analysis and interpretation.

4.7 Data analysis procedure

As each dataset was slightly different, each required slightly different analysis techniques. Ultimately, however, the aim was to produce a linked analysis that could inform theories as to what phenomena had been identified and why they had been present.

4.7.1 Questionnaire analysis

The first operation undertaken with the data collected during the questionnaire survey was that it was imported into the statistical software package, SPSS for analysis. This process in itself, however, required a substantial amount of data sorting and 'cleaning' (Frankfort-Nachmias & Nachmias, 1996; Pallant, 2001). In most quantitative surveys, respondents are asked to indicate their preferences or details, by simply marking a pre-defined answer (e.g. to the question "Do you smoke?" a respondent can either reply 'Yes' or 'No'). Entering data from items such as these into the software is relatively straightforward, as each answer will have a predefined nominal value (e.g. Yes = 1, No = 0). However, in this project an intermediate analysis phase was required before the data from many of the question items could be input into SPSS. In Section 4.6.1 the

importance of using open questions in flood-related surveys was explained. Accordingly, in this survey many of the items did take the form of open questions. This meant that respondents were able to write down anything that they perceived answered the question, as they understood it (Oppenheim, 2004). In order to reduce the complexity inherent in identifying patterns in so many individualised responses, it was important to aggregate similar responses into simplified, yet encompassing, categories. This was achieved through coding (Fielding, 2001). Whilst coding will be discussed in more detail in Section 4.9.2, for the purpose of categorising the survey items, this process was relatively straightforward. Here a coding frame was developed for each open item, whereby, following an exhaustive process, every response was entered into an exclusive category[7], with each category then being assigned a nominal value (*ibid.*). Once each coding frame was complete the data were entered into SPSS.

Once in SPSS, it was possible to produce outputs from the data, such as frequency and percentage tables, very easily. More focused analysis was also made possible by the 'compute' and 'transform' facilities within the software, which allow variables to be aggregated or re-coded in order to measure different facets of the data. Once the details of the individual variables had been explored, it was then possible to move on to investigate relationships between paired variables, with the relevance of bi-variate cross-tabulations being informed by the concurrent qualitative analysis and iterative reviewing of the literature.

The Chi-square test provides a measure of the degree of association or linkage between two categorical variables (Robson, 2005). This measure has been designed to evaluate whether the difference between observed frequencies and expected frequencies under a

[7] For example: Question 11a asks "Imagine the possibility of a flood affecting your home next winter…" Responses to this item such as 'fit air-brick covers' were coded under the category "Resilience measures"

set of theoretical assumptions is statistically significant (Frankfort-Nachmias & Nachmias, 1996). The test is founded on the null hypothesis that there is no difference between two particular variables. Observed frequencies ('counts') are computed for each cell in a bi-variate plot, then if the difference between this count and that which should be expected is sufficiently large that it would only be expected rarely, then the null hypothesis is rejected. For this project, the two probability values that were used to indicate the test had proven a significant relationship were $p < 0.05$ (95%) and $p < 0.001$ (99.9%). These are two of the confidence levels most frequently cited in the literature. If the calculated Chi-square value falls below either of these limits then it is suggested that **overall** there is a relationship between the two variables which is unlikely to be explained by chance factors (Robson, 2005).

The use of the Chi-square statistic does attract a specific warning, however. If the expected frequencies in cells fall below 5 then the test can be unreliable (Pallant, 2001). Therefore, whilst any such sub-minimum cell frequencies can be a problem, it is one that can often be rectified through the recoding of variables to a point whereby no more than 20% of cells have a frequency of below 5 (*ibid.*). However, in some cases aggregation is not possible and in others doing so may compromise the primary data. If either of these limitations were experienced during the analysis then the statistic resulting from the cross-tabulation of the variables was replaced by the notation (χ^*).

Significance testing, such as that provided by the Chi-square test, has been the subject of a degree of controversy. One reason for this is that statistical significance relates to the association between variables, but not the size or importance of that relationship or 'effect' (Robson, 2005). For this reason, effect size has also been calculated for these analyses using the corrected contingency coefficient (Cramer's V). Cramer's V returns a value of between 0 and +1, whereby 0 indicates no relationship and +1 equals a perfect

relationship, regardless of table size. However, Cramer's *V* is a descriptive derivation of the Chi-square statistic itself, rather than the result of an explicit analytical procedure; therefore, it is not discussed explicitly but recorded for information alongside the respective Chi-square statistic in Appendix 4.

In addition to their use in SPSS analysis, the coded, free-text, survey responses were also helpful in the illustration of concepts during the writing of the thesis. In other words, it was often prudent to illustrate one or a range of perspectives, through which respondents revealed a particular feature of their risk perception or experience, through the use of a direct quote. In order to preserve promised anonymity, if a quote from the survey was used, then the respondent was identified by the use of a personal identification code. The labelling protocol is detailed in Table 4.5.

Participant type and Full Code	Town	Gender M / F	Focus Group no.	Personal Identifier
Focus Group e.g. **MbM1_01**	Mablethorpe (Mb)	M	1 (of 2 per town)	01
Key Informant e.g. **Key_Mr01**	Morecambe (Mr)	–	–	01
Survey Respondent e.g. **Surv_ClM-105**	Cleveleys (Cl)	M	–	105 (of 150 per town)

Table 4.5: Key for anonymous-labeling protocol used to identify focus group and key-informant interview participants and survey respondents

4.7.2 Focus-group analysis

> Focus group analysis is a deliberate, purposeful process. It is systematic, uses verifiable procedures, is done in a sequential manner, and is a continuing process (Krueger & Casey, 2000: p.141)

Whereas the responses to the open survey items were primarily sought in order that they could be coded and quantified, the focus-group data was treated somewhat differently.

In attempting to explore the depth, rather than breadth, of the knowledge and perceptions exhibited by a population, it was important to implement qualitative methods. Such methods are more able to illuminate the spectrum of individuals' tangled and sometimes self-contradictory responses, rather than the exclusive categorisations required by quantitative analysis (Robson, 2005). Miles and Huberman (1994) provide a list of the 'analytical moves' they suggest should be regarded as the principal stages of qualitative analysis. These moves involve respectively; coding, interpreting, simplifying, segregating, elaborating and linking the data. However, whilst such a checklist implies a straightforward sequential progression through the analysis, the process is not necessarily so regimented. In fact, during qualitative analysis many of these stages are processed iteratively and reflexively (Robson, 2005).

Before any of these 'moves' could be implemented, a major task was to prepare unabridged transcriptions of the tape-recorded discussions. This task was completed by the author and whilst it was a significant undertaking the process did prove invaluable. This was because during the transcription, the recordings' content, in effect, 'returned to life' and the nuance and character of the discussion re-emerged into the authors mind. This powerful experience allowed the author to imagine and note the particular, yet subtly different, conceptual frameworks that best described the way in which each group had processed the discussion themes.

Once transcripts had been produced, they were imported into the qualitative data analysis (QDA) software package, Atlas ti©. The use of this software has a major benefit over the alternative 'long table' approach to focus-group analysis (Krueger & Casey, 2000). This is the fact that multiple codes can be assigned to passages of speech, without the need to remove them from the contextualising discussion that surrounds it. This facility reduces the dislocation that can occur when the cut and paste

functions of word processing are used to create separate caches of coded text (Robson, 2005).

The initial QDA took the form of re-reading the text in order to identify codable phenomena, with this process being informed by the summary notes made during the enlightening transcription phase. Strauss and Corbin (1998) regard the identification and conceptualisation of phenomena as an essential task for the analyst:

> By the very act of naming phenomena, we fix continuing attention on them. Once our attention is fixed, we can begin to examine them comparatively and to **ask questions** about them (Strauss & Corbin, 1998: p.102, emphasis in original)

Identifiable phenomena can take many forms e.g. an institution, an event or a social interaction. Labelling such phenomena as concepts allows a researcher to group their occurrences together. However, this is not to say that all concepts can be discretely classified. The fact that institutions, events or social interactions themselves can have attributes, which can be interpreted differently by different individuals, means that what appears to be a singularity may actually be classifiable as an example of many concepts[8]. This is another benefit of the Atlas ti © software, as any phenomena that have been coded under different conceptualisations are always presented on the desktop, nested within these other meanings. This is a fundamental aspect of research, because it is through this illumination of the multiple aspects of phenomena that a richer and more informative picture can be revealed and more encompassing explanatory theories deduced (*ibid.*).

Strauss and Corbin (1998) suggest that all named concepts should emerge from the data, i.e. the concepts should be grounded within the context in which they were used.

[8] An appropriate example here would be a flood, which might be regarded by some as a potential disaster or by others as a natural and beneficial process of soil rejuvenation.

Whilst this is an important ideal to be followed during the development of true grounded theory, other authors are slightly less prescriptive about how concepts are identified. Robson (2005) suggests that the "conceptual baggage" that a researcher brings to the analysis and which is derived from her/his knowledge of the literature and pre-existing theory, will inevitably influence the way concepts are 'seen' and named. He suggests that as this stage of coding is a process of comparative analysis (geared at finding similarities rather than connections) this need not be a problem, as long as sufficient concepts are employed in order that saturation might be achieved i.e. it is possible to "*squeeze all the conceptual juice*" (*ibid.*: p.494) out of the data without leaving potentially influential phenomena unaccounted. During this project's coding phase, flood and resilience-related concepts from the literature were specifically used to net a range of phenomena from within the text.

Another part of the Atlas ti © software that was used during coding and beyond was the **memo-writing** facility. Memo writing is an important part of the coding process and drives the analysis by forcing the analyst to confront any lack of logic or coherence within his/her coding frame (Strauss & Corbin, 1998). Code notes are easily attached to the codes or to the quotes themselves and provide a source of information that might otherwise be lost or forgotten within the huge amount of data and ongoing analysis (Lewins, 2001). Memos are not descriptive however; their principal function is analytical and conceptual. As the analysis progresses these memos evolve, from their initial function as notes to guide thinking, to become more dense and complex theoretical and operational notes. This gradual process occurs as the analyst moves from working with the data to the point of analytical distance where theory is constructed (Strauss & Corbin, 1998).

In addition to the fragmentation of text that occurs during the coding phase, the initial analysis also serves other purposes. Section 4.7.1 described how the negotiations that occur within focus-group discussions can reveal important perspectives as to which knowledges are regarded as consensual and which contested. Often, therefore, it was appropriate to identify whole segments of text for analysis if this process of negotiation was illustrated (Hoggart *et al.*, 2002). Through the analysis of the discursive interaction occurring within these sequences, it was possible to gain a greater understanding of both, how singularly expressed attitudes, perceptions or phenomena are approved, conceded or rejected by the wider group, and how 'commonplaces' were achieved (Hoggart *et al.*, 2002); sometimes through the use of humour or irony (Robson, 2005).

Another important feature of the coding phase is the search for **key events**. Key events can influence any social group and how these groups respond to their occurrence can be used as a metaphor for that groups' broader culture and patterns of everyday life (Robson, 2005). In effect, key events can lay bare any potential divergence between what the group members say they might do in any given situation and what they actually do (McKenzie-Mohr, 2000).

Once the initial coding process was complete and the text was divided into its fragmented concepts, deliberations and key events, the next stage of the analysis could begin. During this secondary **axial-coding** phase, the initial concepts were drawn back together in order to build a **web of relationships** (Fielding, 2001). During this phase the codes are analysed in the search for categories or subcategories that cluster together. At this stage, tentative **causal relationships** are hypothesised (Robson, 2005). This operation is conducted within what Strauss and Corbin (1998) refer to as a 'Paradigm Model', wherein the analyst asks a series of questions in order to ascertain if posited

connections between codes can be regarded as meaningful and robust or not (*ibid*.: p.128). These questions are:

- What is the nature of the phenomenon?
- What conditions relate to it?
- What strategy do people involved with it use to handle the phenomenon?
- What are the consequences of these strategies in relation to the phenomenon?

In order to assist with this stage of analysis the 'network' facility of the Atlas software was used to visualise a series of **causal networks** which illustrated the connections that were made (Appendix 5.1-5.6).

The final phase of the analysis involved what Strauss and Corbin (1998) refer to as **selective coding**. During this stage the codes, memos and causal networks produced during the earlier phases are carefully re-examined in order to assess whether their content supported preliminary theories as to what was occurring in the data. This iterative reviewing process sought to identify gaps in logic, to find negative cases, which could have falsified the theory, and to assess the internal consistency of the argument. Once it was judged that the theory had been validated against the data then the only task that remained was to identify suitable exemplar quotes, to illustrate appropriate facets of the theory to readers of the thesis.

4.7.3 Key-informant interview analysis

Key-informant interviews were analysed in a similar fashion to the focus-group discussions. Accordingly, these interviews were also fully transcribed and loaded into Atlas ti © software for analysis. Once again, open-coding was performed in order to identify particular concepts within the data. In this case, however, these concepts were

more associated with the identification of formal structures and the operating procedures of the FRM organisations and institutions, than with risk perceptions and networks.

After this initial process was complete, however, the analysis became more inclusive. Instead of performing axial coding with just this key-informant data, these concepts were integrated with those produced from the focus-group material. Axial coding the two datasets in this way was important. The co-analysis revealed where the publics' perceptions and expectations of what the FRM institutions offered them, or of what they **should** offer them in regards to resilience building, differed from what those institutions' agents suggested they wanted to offer, or what they feasibly **could** offer. The consistencies and inconsistencies revealed during this process were vital in informing the theory-building process.

4.8 Final analysis

As the respective data were collected and analysed, the mixed-methods approach began to show just how context-specific the results of the different analyses really were. Quantitative methods did reveal interesting patterns of resilience and vulnerability that expanded upon prior research. However, qualitative techniques, rather than simply confirming these phenomena, actually revealed the more subjective and sometimes contradictory nature of the reasoning that research participants used to justify the range of perceptions or world views that were apparent in the survey responses (Greene ***et al.***, 1989; MacDougall & Fudge, 2001). For example, the implications of using a taxonomic definition of what constitutes a flood-vulnerable social group (e.g. the elderly) – as was predicated in the use of tools such as the SFVI – were directly tested, through the more qualitative approach of actually listening to how members of these groups perceived or demonstrated their own vulnerability.

Despite this complexity, it is important that chosen methods 'make sense' within one theoretical perspective (Baxter & Eyles, 1997). Accordingly, within this project, the more quantitative analyses of the coded survey-data and large datasets provided an important structure upon which to hang the more interpretative and subjective aspects of the discussed perceptions. Ultimately, this allowed research questions to be answered by linking the explanatory detail of the small ('the particular') across a broader canvas. This linking of methods effectively enabled [as Mason, 2006, would suggest] …

> "…the focus of the research (rather than its by-product or background) to be upon how social experience and 'real lives' are simultaneously or connectedly 'big and little', global and local, public and private, and so on." (*ibid.*: p.15)

However, in relation to the building of solid theory from within the micro (i.e. from within a participant's subjective knowledge or perception of processes, such as of climate change or flood risk), it is important to appreciate that these were always subject to the vicissitude which invariably results from such influences as, for example, the media or meteorology (Foddy, 2003). These are effects which unavoidably alter every individual's perspective on, or perceptions of, the subjects under investigation and these effects may not occur in predictable ways[9]. Thus, whatever methods were used, this project is essentially unrepeatable; not least because respondents' understandings will have been affected simply by taking part in the survey (Hoggart ***et al.,*** 2001). This should not be taken to mean that these research findings are without validity. These analyses were neither built purely around the author's subjective interpretation of the data, nor on a transient understanding of a few individuals. The project's validity comes as the result of

[9] For example, in the period between the questionnaire survey and the focus group discussions, England suffered two of its most disastrous pluvial flooding events since records began in 1766 (Pitt, 2008). These events became a theme within all the group discussions, as issues regarding drainage infrastructure were brought to the fore, regardless of the fact that the principal hazard of interest to the research was sea flooding.

the iterative and reflexive nature of the analytical process itself and as the result of the objective rigour that was used throughout.

4.9 Chapter Summary

This chapter has described and justified in some detail the methods used to undertake this research project. It has explained how the application of these techniques was guided by a framework of methods that nested within the overall research design. The discussion described the selection of primary and secondary data sources and explained the sampling strategy used to recruit a sample population that possessed attributes that were representative of a particular coastal flood-hazard exposed population (i.e. residents of flood-vulnerable towns).

It was explained how the two aspects of the research, the quantitative and the qualitative, were undertaken through the implementation of the questionnaire survey and the focus-group discussions. The methods used to introduce the key informants' perspectives into the project were also described. Importantly, the analysis techniques used to draw information and explanations from the data have been discussed. The respective roles of data description, interpretation and theory-building have been explained, as have many of the limitations and biases that might be considered to influence the analyses at any point. In discussing the nature of the limitations, however, the importance of linking complementary techniques into triangulation has been highlighted. Triangulation is not without its critics, but it has been argued here that the fact that similar findings have been obtained through the implementation of a number of diverse methods, give the results of this project validity; notwithstanding that inevitable caveats apply.

In explaining the practice surrounding qualitative analysis techniques in particular, Strauss and Corbin (1998) point out that in their application of grounded theory:

> "…objectivity does not mean controlling the variables. Rather it means openness, a willingness to listen and to "give voice" to respondents … it means hearing what others have to say, seeing what others do and representing these as accurately as possible" (*ibid.*: p.43).

From this perspective, an objective approach necessitated that the author maintained cognisance throughout, of the possible effect that personal positionality might produce in his interpretation of data, or in its representation. During this project, therefore, it was the author's conscious intention to retain an open perspective. The aspiration was, to provide as rigorous an assessment of the different data as possible; both in their concurrency and their diversity.

Now that the methods have been introduced, Chapter 5 will describe the case-study towns.

5 Case Study Sites

5.1 Introduction

In Section 4.4 the GIS-based methods that were used to select the case-study sites were introduced. The analysis of the three existing datasets (the SFVI, the IMD 2004 and the Flood Map) in this way allowed for the deprivation and flood-vulnerability status of all coastal towns to be shown in map form. However, not all these towns fitted the second selection criterion related to previous flood history. Therefore, the GIS analysis needed to be supplemented with a literature review in order that the number of prospective case-study sites could be reduced.

5.2 Previous flood history

Once the coastal population could be characterised within the GIS, a literature review and site research revealed three historical flood events to be of particular interest. These were the East Coast flood of 31st January – 1st February 1953 (Baxter, 2003; Pollard, 1978; McEwan, 1988) and the flooding experienced around Morecambe Bay on the northwest coast in November 1977 and January 1983 (Wrigley, 1991; MBSMPP, 1999). Accordingly, settlements that were affected by these events were investigated in greater detail. Table 5.1 lists a number of the settlements that were investigated as potential sites, along with those that were finally selected. Figure 5.1 illustrates the geographical location of these towns; Mablethorpe, Cleveleys and Morecambe.

Settlement	G.O. Region	Visited Y/N	Comments
Cleveleys	NW	Y	**Selected**: Flooded in 1977 the Jubilee area of the town was chosen due to nature of settlement (a mixture of single and double storey buildings) and demographic characteristics.
Felixstowe	East	N	Of interest: Flooded in 1953 with the loss of 40 lives. Distance considered unnecessarily problematic.
Fleetwood	NW	N	Of interest: Considered due to damage inflicted during 1977 flood but dropped in preference to Cleveleys
Great Yarmouth	East	Y	Of great interest and originally chosen due to extreme nature of flood risk in parts of the city but deselected following a severe pluvial flood event in 2006. It was considered that this event would have unavoidably affected the risk perceptions of any population sample. In places the sea defence AEP in Great Yarmouth is as low as 1:42 (Halcrow, 2006).
Grimsby	Yorks & Humber	N	Of interest but rejected in favour of Mablethorpe, due to its more industrial rather than 'seaside' nature.
Kingston on Hull	Yorks & Humber	N	Of interest but as a city it was not considered comparable with other selected (town) sites.
Mablethorpe	E-Mids	Y	**Selected**: The Mablethorpe coastline was completely inundated in 1953 with the loss of 16 lives. The isolated nature of the town presents particular challenges in relation to sustainability and blight.
Middlesborough	NE	N	Considered but thought too urbanised and with greater perceived exposure to intra-urban rather than sea flooding.
Morecambe	NW	Y	**Selected**: Seriously flooded in 1977 this town was both easy to access and an example of a town striving to regenerate itself despite retaining significant levels of social flood vulnerability in some areas.

Table 5.1: Selecting Case Study Sites

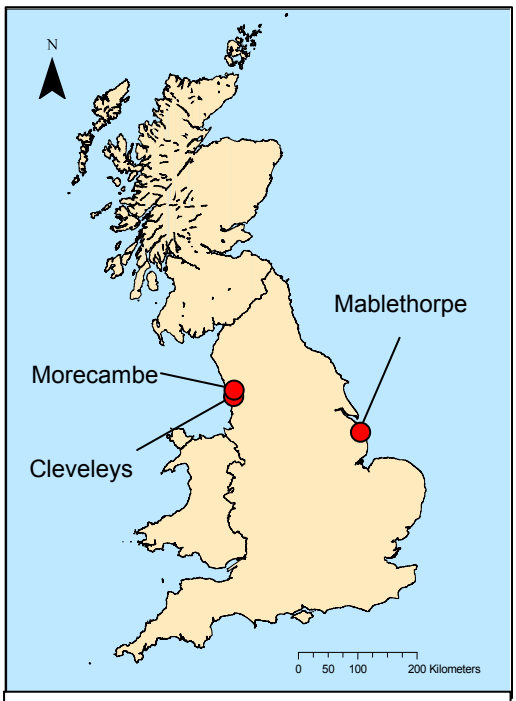


Figure 5.1: The geographical location of the project's three case-study sites within the UK
Map source: EDINA (2007)

Whilst each of these three towns did possess unique characteristics, they were also broadly representative of any number of other English coastal towns (House of Commons, 2006). Importantly for the project, their populations could be objectively quantified as possessing characteristics of flood vulnerability and deprivation. Furthermore, in addition to these important selection criteria, each town was also undergoing some form of regeneration, after a downturn of their once popular image. From a flood-risk perspective, each town was regarded as having structural defences that offered a protection standard of ≤0.3% Annual Exceedance Probability (AEP). At the same time, however, each was also formally acknowledged to retain an element of residual risk, which was directly related to their exposure to a low probability / high consequence sea flood hazards (WBC, 2007b; ELDC, 2005; LCC, 2007). All these

factors, which informed the decision to select these three towns, will now be discussed in more detail.

5.3 Mablethorpe

5.3.1 Overview

Mablethorpe lies on a stretch of the east coast of England that is regarded as a holiday destination of national significance (ELDC, 1999). Unlike Skegness to the south, the town has not been subjected so extensively to development through the spread of caravan parks, but instead, has retained an air of the 1960s beach resort. However, the holiday parks that stretch between the two towns do represent the largest concentration of caravans in Europe (ELDC, u/d).

In spite of its contemporary importance as a tourist destination, this stretch of coastline is particularly vulnerable to both storm-surge flooding and coastal erosion (ELDC, 2005). In fact, it has been suggested that the settlement of Mablethorpe was originally situated a mile further east than it is at present; a geographical location which is now situated beneath the North Sea. This changing coastal environment is explained by the fact that, geologically, the low-lying coastal plain where the town has developed is composed predominantly of erodible sediments, which were lain down during the last glacial retreat. The town's location also denotes a natural fulcrum point between coastal processes, with relative sediment stability to the town's north, but with erosion occurring to its south (Windram, 1997). Until 1994, this process of erosion was resulting in such a loss of sediment to the sea that the 24km section of coastline, running between Mablethorpe and Skegness, was regarded as a shoreline in retreat.

5.3.2 Flood history

The most significant flooding event in modern Mablethorpe's history occurred on the night of January 31st 1953. During this event an intense cyclonic system drove a storm surge down the east coast of England and across the Channel to the Netherlands. In England, flooding caused as the sea over-topped and breached sea defences resulted in 307 deaths along a damage front that ran from the Humber Estuary to the Kent coast. This total number of fatalities was divided into 5 main clusters; of which one cluster of 16 deaths was centered in Mablethorpe (Baxter, 2003). As the sea broke through the defences protecting the town, the torrent of water flowing down the main street was so strong that it created a bow wave where it struck buildings; a clear indication of high velocity flow (Ramsbottom *et al.*, 2003). This is despite the fact that, even in failure, the concrete construction of the sea defences had acted to reduce the magnitude of these effects (Muir Wood & Bateman, 2005). The town was completely inundated to a depth of ≤2m, which necessitated the temporary evacuation of around 90% of the population into the surrounding area (Pollard, 1978). The flood outline from this event, which was calculated to have a 2% (1:50) return period, has been used subsequently by the Environment Agency (E.A., 2007) and East Lindsey District Council (ELDC, 2005) to delineate the high-risk Flood Zone 3.

Since 1953 substantial investments have been made to improve the sea defences along the Lincolnshire coast. Historically, sea defence was provided by natural dune systems and concrete walls and revetments. After the 1953 event, however, it was realised that these types of defences were highly vulnerable to overtopping, which is a process that leads to rapid erosion and subsequent breaching during storm-surge events (French, 2001). Accordingly, in 1991 the National Rivers Authority commissioned the 'Lincshore sea-defence strategy'. This was a risk-assessment project, which after considering all the local factors, concluded that beach

nourishment was the preferred long-term option to reduce flood risk along this coastline (E.A. 2004b). In accordance with these findings, since 1994, 9 million cubic metres of material has been laid along this coastal stretch; thus, making the Lincshore Project the largest beach nourishment project in Europe (INTERREG, 2004).

This sand provides a defensive berm, which saps a wave's energy prior to its arrival at the more traditional reinforced dune, boulder and concrete defence structures that line the shore. Despite the on-going work that is required to maintain the defensive berm, a recent study revealed that in certain high population areas, including Mablethorpe, the berm width was falling below that which was modeled as defining a 0.5% AEP protection (E.A., 2004).

In consideration of this factor, and the nature of residual risk more generally, the fact that the town remains exposed to potential extreme events or defence breaching is made explicit in East Lindsey District Council's Strategic Flood Risk Assessment (ELDC, 2005).

> "In accordance with Defra standards, the indicative standard of defence for the Lincshore area is protection from tidal flooding events with an annual probability of between 1% AEP and 0.3% AEP (1-in-100-year and 1-in-300-year). However, there are areas with inadequate standards of defence due to low beach levels. In particular 94% of the structures are considered likely to withstand a return period of 1-in-100-years, 79% can withstand a return period of 1-in-200-years and only 69% can withstand a return period of 1-in-300-years" (ELDC, 2005: p.34)

Due to its flat and low lying nature, parts of Mablethorpe also suffer from chronic but apparently localised pluvial and groundwater flood hazards. Whilst the Environment Agency are responsible for the mitigation of the sea-flood hazard the Lindsey Marsh Internal Drainage Board (IDB) is responsible for the culvert and pump system which is operated to mitigate surface-water hazards to a 2% to 4% AEP (ELDC, 2005). Despite the Lindsey Marsh's oversight of significant drainage infrastructure, surface-water flooding has resulted in the shallow inundation of a number of houses in the

town on numerous occasions in recent years. Plate 5.1 is an image of the seawall, dune and beach defences of the town.

Plate 5.1: Looking north along the sea defences at Mablethorpe from 'Kids Adventure World'. *NB.* Three forms of defence are visible; the dune system, the nourished beach and the engineered concrete seawall.
© The author

5.3.3 Flood warning arrangements

In relation to the receipt of formal flood warnings, at the time of this project's questionnaire survey, only 420 households in the town had been offered the opportunity to register to the Environment Agency's 'Flood Warnings Direct' service (Key_Mb03): from this only 179 households had taken up the offer. Formal indirect warnings are issued to the population within the East Lindsey District Council area by the local media, through the system of early-warning sirens that operates along the Lincolnshire coastline and through the 'Floodline' service (*ibid.*).

5.3.4 Demographic characterisation and final sample selection

In the 1951 census the population of Mablethorpe was recorded at 6,472 (UKDA, 2005)[1]. Two years later, newspaper reports estimated that between 4,000 and 6,000 of these residents were evacuated to Louth in the days after the catastrophic east-coast flood (Grimsby Telegraph, 2003). Since this time the towns' population has increased to ~11,765 (IMD, 2004). This equates to an almost doubling of the at-risk population.

Mablethorpe itself, jointly with Skegness, provides the highest percentage of multiple -occupancy accommodation in the district (ELDC, u/d). Although the prevalence of lone-parent households is low in comparison with the national average, there appears to be an aging within the population that may bear some relation to the fact that 36.6% of residents report that they suffer from a limiting long term illness (Table 5.2: ONS, 2007). Although correlation is not established, this illness statistic should be viewed in conjunction with the fact that 26.4% of households have no access to a vehicle (*ibid.*). In light of all these factors the community is illustrative of a population not only potentially highly vulnerable to rapid onset hazard events but, perhaps more importantly, to the prolonged stress, sickness and financial hardship that has been shown to follow such an event (Tapsell & Tunstall, 2008).

5.3.4.1 IMD and SFVI mapping

Concentrations of multiple deprivation in Mablethorpe are very high. Using the Index of Multiple Deprivation data, as applied by Walker *et al.* (2006), it can be seen that the whole of Mablethorpe is designated within deprivation deciles 1 and 2 (Figure 5.2a). This level of deprivation places the population within the 10% most-deprived census wards in the country (ELDC, u/d).

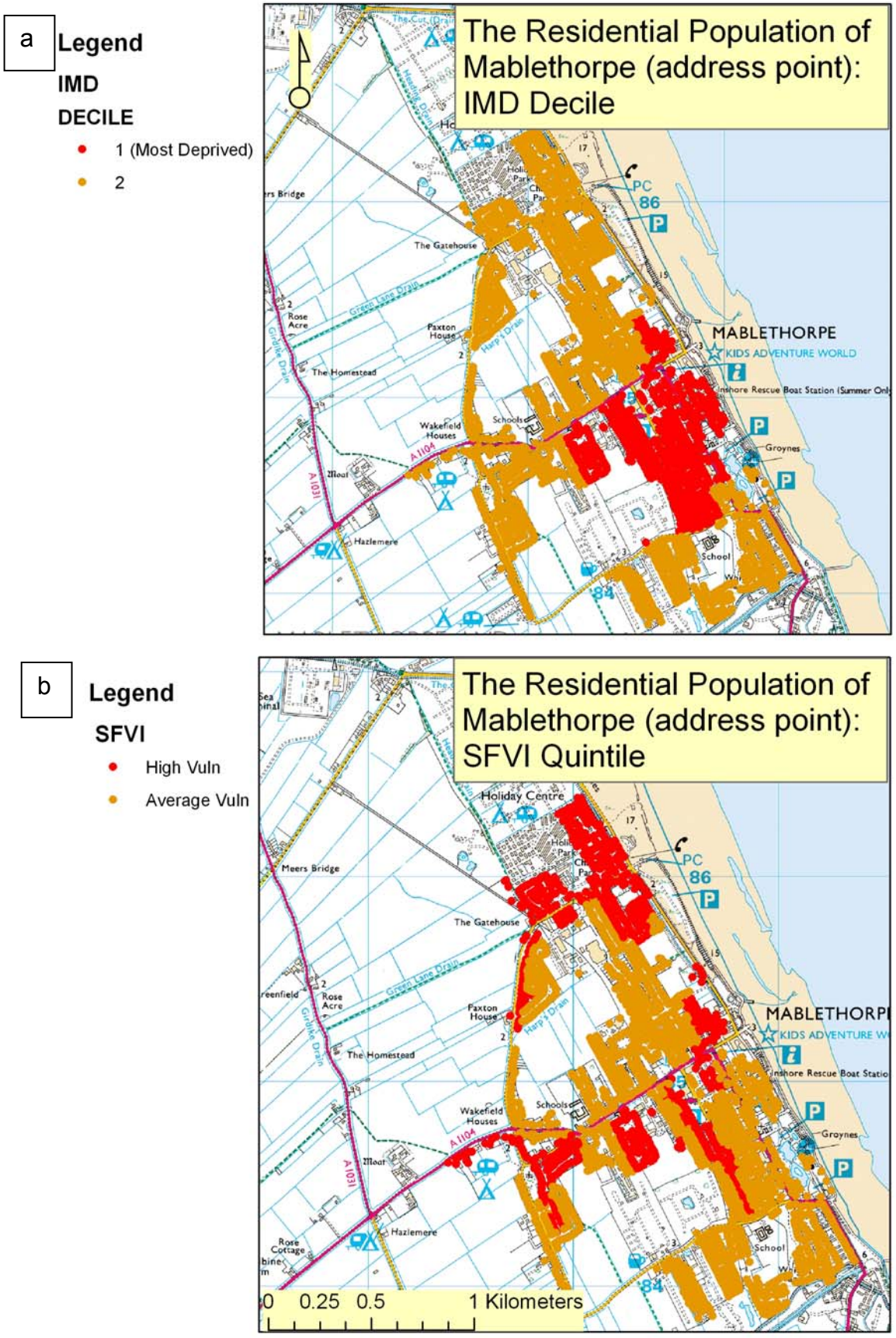
[1] *NB*. not accounting for census-ward boundary changes

Key-Statistics	Mablethorpe (%)	National (%)
Housing: Owner occupied: Owns outright	43.4	29.1
Age: Under 18	18.5	31
Age: 75 years and over	14.9	7.5
People with a limiting long-term illness	36.6	17.9
People aged 16-74: Economically inactive: Permanently sick / disabled	55.6	5.3
Unemployed	2.2	1.5
Vehicle: No Household access	26.4	26.8

Table 5.2: Census key-statistics in relation to the population of Mablethorpe (mean of 3 wards) in comparison to the national average ward statistics. Source: ONS (2007)

By applying the SFVI at address-point resolution in the same manner, a slightly different pattern becomes apparent. Whilst no SOA falls within the Very-High vulnerability Category 5 in the SFVI dataset, the entire population of the town is still attributed with either a high or an average flood vulnerability characteristic (Figure 5.2b).

Figure 5.2: Mablethorpe: Categorisations of population (a) multiple deprivation and (b) social flood vulnerability, at Super Output Area resolution. Map © Crown Copyright OS 1:25,000 Colour Raster 2007. An Ordnance Survey/EDINA supplied service



5.4 Cleveleys

5.4.1 Overview

The town of Cleveleys lies between the harbour town of Fleetwood on Lancashire's Fylde Peninsula to the north and Blackpool to the south. The Fylde peninsula itself has formed as a result of both the south-north flow of the River Wyre depositing alluvium on its eastern shore and marine deposition on the western shore. These ongoing processes of deposition and erosion have resulted in the formation of the spit of land constructed from glacial till (eroded from the Blackpool boulder clays), marine alluvium and also some pockets of windblown sand. Drumlins are evident on the western bank of the Wyre that were formed during the glacial recession ~10KaBP (WBC, 2004). Overall, these geomorphologic processes have resulted in very low rates of vertical aggradation, meaning that 65% of the peninsula is situated below 5.5m AOD (*ibid.*).

Settlement on the peninsula is recorded in the Doomsday Book, but the majority of the urbanisation has occurred since the early 19th century. The history of the settlement centres mainly on the importance, as a fishing port, of the neighbouring Fleetwood. However, the 19th century saw an expansion of settlement on the peninsula, owing to the increasing popularity of the coastal area as a holiday destination. As the area began to develop in this way it was realised that erosion rates of up to three yards (~2.8m) per year along the western shoreline of the peninsula were unsustainable. Accordingly, sea defences have been constructed in phases in order to combat this problem (Rothwell, 1992). Whilst the most recent phase of engineering work at Cleveleys did coincide with the fieldwork phase of this project, this construction work stopped 100m south of the sample area. Plate 5.1 is an image of the existing defence structure that protects the Jubilee Ward.

Plate 5.2: Looking north along the seawall at Cleveleys with the Jubilee ward to the right. *NB.* This stretch of the seafront is embanked. The ward itself is situated at a lower elevation behind this sea frontage. © The author

5.4.2 Flood history

The Fylde peninsula has a long history of flooding, with major events usually occurring coincidently with those in Morecambe. This is due, both to the settlements' proximity to each other on the eastern shore of the Irish Sea, and to the bathymetry of Morecambe Bay itself, which predicates that similar storm-wave and tidal conditions are often experienced in both towns during extreme meteorological events. Historical records describe severe flooding of the peninsula as far back as 1555, when the settlement of Singleton Thorpe was irrupted and lost to the sea. More recent notable events include those of 1927, when six lives were lost, and 1977 when 1,800 homes in Cleveleys and Fleetwood were flooded to depths up to in excess of one metre (WBC, 2004).

Cleveleys forms Management Unit 2/2 of Coastal Process Unit (CPU) 11b/2 in the Morecambe Bay Shoreline Management Plan (MBSMPP, 1999). Development in the hinterland of the town's current defence line is valued at in excess of £30 million.

Therefore, the assessment that has been made as part of the SMP is that the defence strategy to be adopted for this management unit, in the short and the long-term, is one of 'hold-the-line'. In effect, it has been decided that it is cost effective to maintain or improve the current defence structures in order that the town continues to be protected (*ibid.*). Despite this commitment to structural defence, the importance of anticipating and managing the residual effects associated with potential extreme events, is acknowledged within the Borough Council's Strategic Flood Risk Assessment and a dedicated emergency plan (WBC, 2007a; WBC, 2007b).

5.4.3 Flood warning arrangements

At the time of the project fieldwork, none of the residential properties within the sample area has been offered the opportunity to register to the Environment Agency's 'Flood Warnings Direct' service. This is because none of these properties lie within the Agency's 'direct-warning zone'. However, a mail-based awareness campaign has been undertaken to alert residents of this ward to the existence of the 'Floodline' service. Should an extreme event be forecast, then indirect warnings would be issued by the local media and through other standard operational means (Key_Mr02).

5.4.4 Demographic characterisation and final sample selection

According to the Census, in 2001 Cleveleys had a population of 31,157, with the population split between the five census wards of Jubilee, Cleveleys Park, Norcross, Staina and Victoria. Although the majority of all the wards are situated within the Environment Agency's high-risk Flood Zone 3 this project concentrated on the Jubilee ward, which is situated behind the seawall, between the town centre and Rossall (see Figure 5.3). This ward contains 1,951 households comprising ~4,186 persons (Census 2001). In an analytical sense the Jubilee Ward represents a '*chunk*' of the population taken from Cleveleys, which is the sample '*place*' (Frankfort-Nachmias &

Nachmias, 1996: p.192). Table 5.3 shows some key statistics for this sample population contrasted against town and national statistics.

Key-Statistics	Jubilee Ward (%)	Cleveleys (%)	National (%)
Housing: Owner occupied: Owns outright	48	45.1	29.2
Age: Under 18	16.5	19.7	31.1
Age: 75 years and over	16.9	13.1	7.5
People with a limiting long-term illness	47.6	42.3	17.9
People aged 16-74: Economically inactive: Permanently sick / disabled	45	38.8	5.3
Unemployed	1.5	1.2 (Wyre)	1.5
Vehicle: No Household access	33.3	24.9	26.8

Table 5.3: Census key-statistics in relation to the population of Jubilee Ward, and Cleveleys Town (mean of 5 wards) in comparison to the national mean ward statistics. Source: ONS (2007)

The key statistics indicate that a higher proportion of the population of the Jubilee Ward than the national average is over 75 years of age. There is also a higher concentration of long-term illness and fewer households have access to a vehicle than the national average. Conversely, nearly twice as many people own their homes outright than is reported nationally.

5.4.4.1 IMD and SFVI mapping

Using the IMD data, the population of the Jubilee ward is revealed to exhibit the lowest concentrations of multiple deprivation of all three case-study sites (Figure 5.3a). All households are categorised within decile 4 or 5. However, when subjected to SFVI analysis there appears to be an interesting reversal of household circumstances (Figure 5.3b). Using this index it can be seen that the population exhibits a greater range of social flood vulnerability than the other sites. Interestingly,

however, the zone that exhibited the least deprivation in the IMD analysis (dec 5) now exhibits the highest levels of flood-vulnerability. This is particularly interesting, because during a site visit it is in this zone there was found to be a predominance of single-storey residences. So, whilst the level of multiple deprivation is relatively low in this zone, the vulnerability, as indicated by SFVI variables, is high and this is compounded by the objective physical vulnerability to flooding, which results from having restricted means of vertical evacuation (Kelman, 2002). The area indicated as having slightly higher deprivation (Decile 4) but the least vulnerability to flooding (Category 2), by contrast, also has the highest proportion of two storey dwellings. This dichotomy, between the IMD and the SFVI results (which pervades even if the IMD data are aggregated into quintiles), appears to be indicative of the '*slightly confusing'* nature of the IMD dataset (Section 4.4.1.1). Whether this effect is simply an artifact of using SOA data to investigate patterns at an inappropriate resolution is uncertain[2]. However, its presence did strengthen the argument for focusing later analyses on a single dataset and for that dataset to be the designed-for-purpose SFVI.

[2] See footnote in Section 4.4.1.2 regarding the 'ecological fallacy'

Figure 5.3a: Cleveleys, Index of Multiple Deprivation. Map © Crown Copyright OS 1:25,000 Colour Raster 2007. An Ordnance Survey/EDINA supplied service

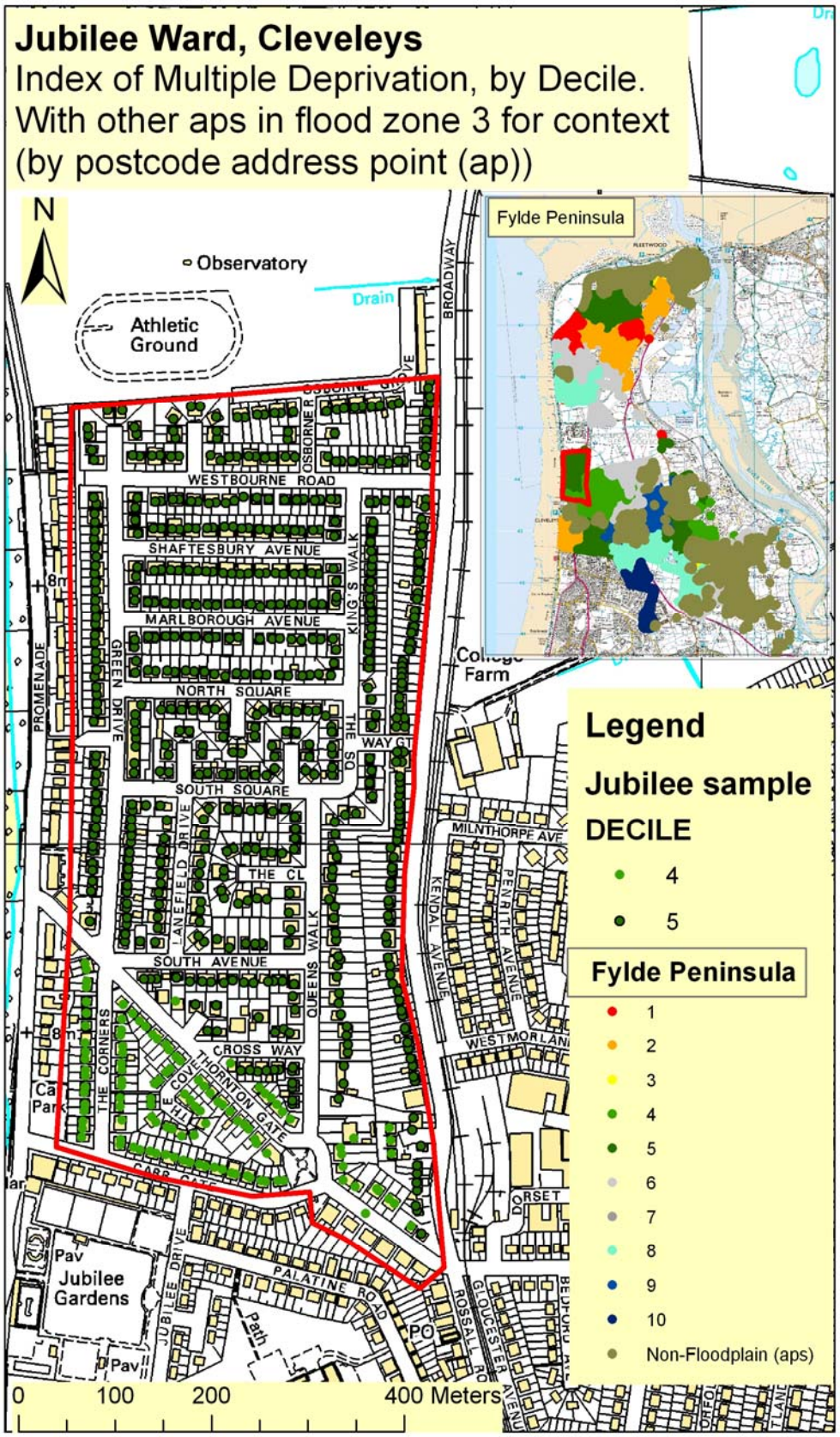
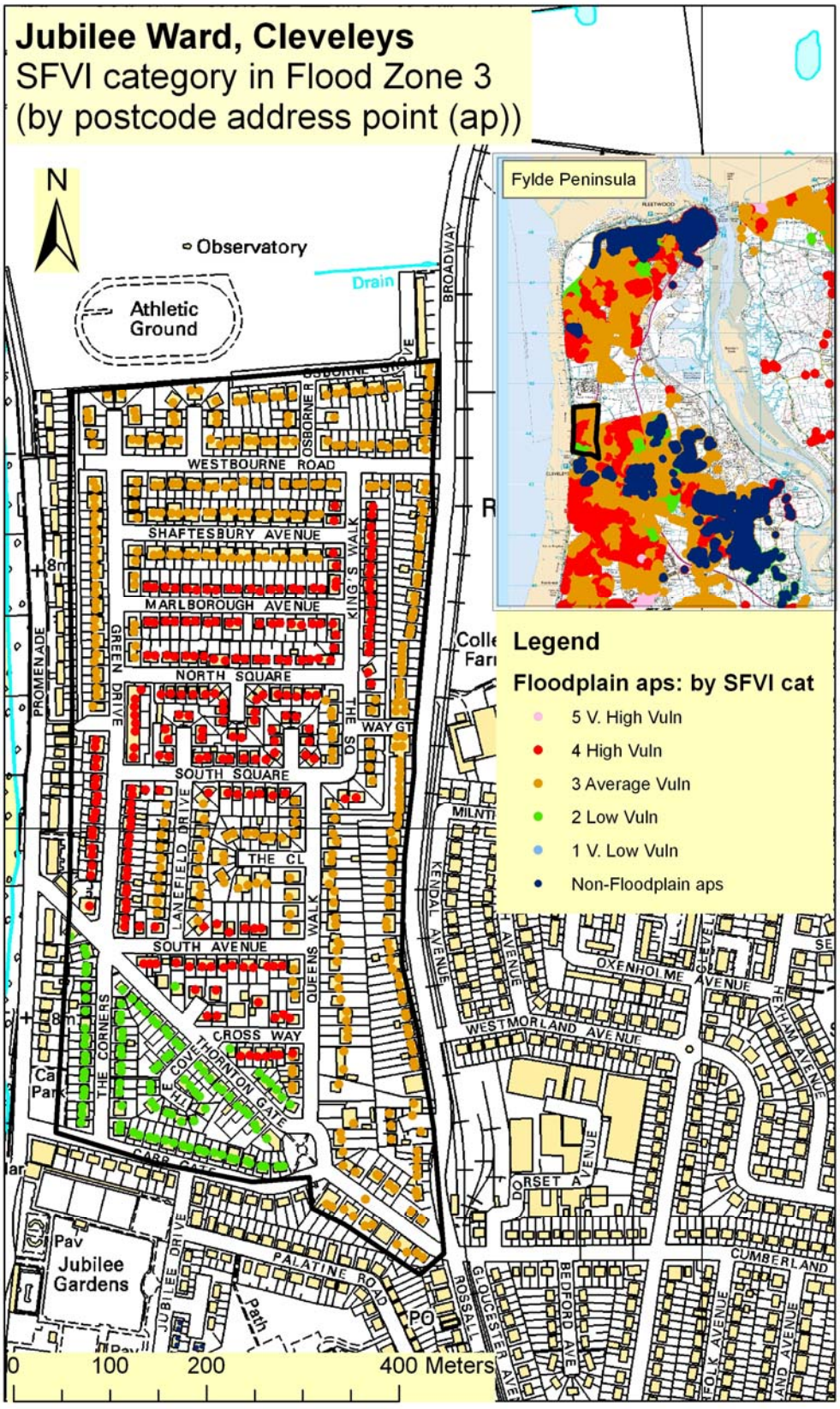


Figure 5.3b: Cleveleys, Social Flood Vulnerability Index. Map © Crown Copyright OS 1:25,000 Colour Raster 2007. An Ordnance Survey/EDINA supplied service



5.5 Morecambe

5.5.1 Overview

Morecambe (née Poulton-le-Sands) a town with a population of around 40,394 (2001 Census) lies on the Eastern edge of Morecambe Bay in Lancashire approximately 20 miles north of Cleveleys. The underlying solid geology of this section of Morecambe Bay area takes the form of sedimentary mud and sandstone which were overlain during the last ice age by glacial till up to 80m thick. Post-glacial eustatic sea level rise resulted in the drowning of some of these glacial sediments and the formation of the 310km² Morecambe Bay inter-tidal zone. This area has now been designated a European Marine Site, a Special Conservation Area and a Ramsar site (MBP, 2004). Fast flowing tides with a range of 10.5 metres, in combination with these soft erodable sediments make the Bay one of the most dynamically changing features of the UK coastline (*ibid.*).

Prior to the 20th Century the town of Morecambe was predominantly a fishing port. Principally operating through the 'beach port' (i.e. fishing boats were moored offshore at high-water and allowed to rest on the sand as the tide went out), the industry reached its peak in the early 1900s. Thereafter, declining fish stocks, competition from harbour-based fleets and the development of Heysham Harbour, encouraged a reorientation of the local economy toward tourism. Following the building of a rail link from Lancaster, the position of Morecambe with its views across the Cumbrian Mountains, assisted in the rise of its popularity as a holiday or day-visit resort. Although the 1950s represented the boom time for the town its decline through the 1970s, to a nadir in 1991, was brought about by the growth of the foreign package holiday industry (Carter, 2004).

In an attempt to reverse the decline of the town, Morecambe has been designated as a second-tier strategic tourism development area within the Joint Lancashire

Structure Plan (LCC, 2005). This means that its tourism development is to be coordinated in order to draw from regional and wider sources. This development must, however, be accommodated within the existing urban area (*ibid.*). The town is currently in the midst of a £40 Million regeneration, which includes the 'Tern Project' (a structural art and poetry based initiative to enliven the 'Stone Jetty' area) and the redevelopment of the art deco Midland Hotel on the sea wall. The perceived success of these initiatives has led to a minor resurgence of the town's popularity, which is now recording around 300,000 day visits and 1.5 million bed-nights annually. In response to concern expressed by local traders, about the lack of a marina restricting development potential (Carter, 2004), a recent proposal for a state-of-the-art marina development has recently won a prestigious national design award. Despite this on-going regeneration work, however, there remains a perceived problem with the Sandylands and 'West End' areas of the town. Over the years these areas have come to be regarded as an area of cheap accommodation for those living on benefits. As the town's Member of Parliament, Geraldine Smith, stated in October 2007:

> "[T]he West End suffers from a complex range of socio-economic issues including extreme unemployment, low incomes and the highest crime levels in the District of Lancaster. The Chatsworth Gardens site area falls within the 0.5 per cent. most deprived Super Output Areas...across England. It is clear that there is a relationship between the socio-economic decline and the housing stock that is typical of the legacy commonly left in declining coastal resorts. The site contains 3-5 storey former bed and breakfast guesthouses which are now used as poor quality privately rented Houses in Multiple Occupation...These currently generate substantial returns for landlords in the West End with 'high yields'. At the same time they are fuelling social, economic and environmental deprivation and decline and continuing the negative image that currently exists of Morecambe." (Hansard, 2007)

5.5.2 Flood history

Due to its location Morecambe is particularly exposed to winds from the south and the west. Storm surges associated with such prevailing winds have been responsible

for the flooding of the town on a number of occasions, most notably in 1898, 1907, 1927, 1977, 1983 and 1990 (Wrigley, 1991).

The first work on sea defences around the town occurred in 1848, when the stone jetty and harbour were formed. Since this time, there have been regular upgrades to the walls, although, most of these works have been undertaken in response to damaging storms (LCC, 2003). Following one particular storm in 1977, during which southerly winds gusted to Hurricane-Force 12 and caused severe flooding (1,300 properties) the City Council…

> "…resolved to carry out improvements to Morecambe's sea defences in order to contain, **within acceptable limits**, overtopping resulting from a recurrence of [these] storm conditions" Wrigley, (1991: p.9) [emphasis added].

Despite the construction activity that occurred as a result of this event, in January 1983 flooding of a similar extent occurred in the town following further over-topping of defences. On this occasion, however, a more westerly wind prevailed which resulted in new wave-reflection walls being over-topped for 15-20 minutes, leading to the flooding of 1,516 properties (800 flooded above the ground floor). Expenditure on sea defences had been increasing annually and after this event it…

> "… achieved a level which caused the Local Authority to question the integrity of the defences in protecting the town, not only from flooding but from erosion of the coastline." Wrigley, (1991: p.12)

Following this realisation, that the town would remain inherently vulnerable regardless of what money was invested in hard-engineered solutions, the Local Authority initiated a scheme that could integrate wave reflection with 'softer' coastal-defence measures. In 1984 the 'Morecambe Coastal Study' was commissioned to investigate alternatives; it finally reported in 1986. The report proposed the construction of headlands, wave reflection structures, groynes and natural and artificially nourished beaches along the sea frontage, with the work to be carried out in seven phases. Work commenced on Phase one in 1989.

In 1990 two flooding events occurred on consecutive days, which again overtopped defences along the seafront. The cost of repairing the existing defences after these events was ~£2 million. However, whilst they were of similar magnitude to the storms of 1977 and 1983 only 150 properties were flooded on this occasion. This led to expressions of satisfaction in the effectiveness of the new defence structures:

> "This significant reduction [in damage] is attributable not only to the investment in sea-defence infrastructure but to the damage containment procedures undertaken by the Authority and the local police before and during the storm events." Wrigley, (1991: p.19)

Despite this apparent risk reduction, the fact that the town remains at risk from potential extreme events or defence breaching is made explicit to Lancaster District Council by the consultancy firm Jacobs, whom the council had commissioned to prepare a Strategic Flood Risk Assessment (LCC, 2007).

> "Although these raised defences may be formally maintained, it is important to reiterate that the risk of flooding can never be fully removed. There will always be a residual risk of flooding, due to (for example) a more extreme event, changing climatic conditions, a structural failure of the constructed flood defence system or flooding behind the defences due to local runoff or groundwater." (*ibid.*: p.11)

Plate 5.3 shows a view along a section of the engineered defences.

Plate 5.3: Looking south toward 'The Stone Jetty', along the seawall and beach at Morecambe. Source: Cripps (2007)

5.5.3 Flood warning arrangements

Flood warnings are issued to the population of Morecambe's West End by direct and indirect means. At the time of the questionnaire survey only 35.5% of the 2,571 properties offered the service in the town had registered to receive Flood Warnings Direct messages. The remaining properties are covered by indirect warnings such as media broadcasts, the 'Floodline' service and other operational measures (Key_Mr02).

5.5.4 Demographic characterisation and final sample selection

The town of Morecambe lies within the District of Lancaster and is contiguous to the city itself. In 2001 the town's total population numbered 40,394 (Census 2001). Of this population 59.73% reside in an area delimited by the Environment Agency's high-risk Flood Zone 3. Table 5.4 shows a series of key demographic statistics for the town and nation at ward resolution.

Key-Statistics	Morecambe (%)	National (%)
Housing: Owner occupied: Owns outright	29.2	29.2
Age: Under 18	25.2	31.1
Age: 75 years and over	8.6	7.5
People with a limiting long-term illness	41.1	17.9
People aged 16-74: Economically inactive: Permanently sick / disabled	38.3	5.3
Unemployed (16-74yrs)	2.8	1.5
Vehicle: No Household access	39.5	26.8

Table 5.4: Census key-statistics in relation to the population of Morecambe (mean of 4 wards) in comparison to the national ward statistics. Source: ONS (2007)

5.5.4.1 IMD and SFVI mapping

Using the IMD data analysed by Walker *et al.* (2006), high concentrations of deprivation are evident across the town. Figure 5.4 shows the concentration of most-

deprived (Decile 1) and least-deprived (Decile 10) households living on and off the floodplain. In all, 18,495 (45%) of the town's population fall within the two most deprived deciles, of which 51% reside within Flood Zone 3.

Figure 5.4: Index of Multiple Deprivation: Morecambe population ON and OFF the floodplain (by decile: Walker *et al*., 2006)

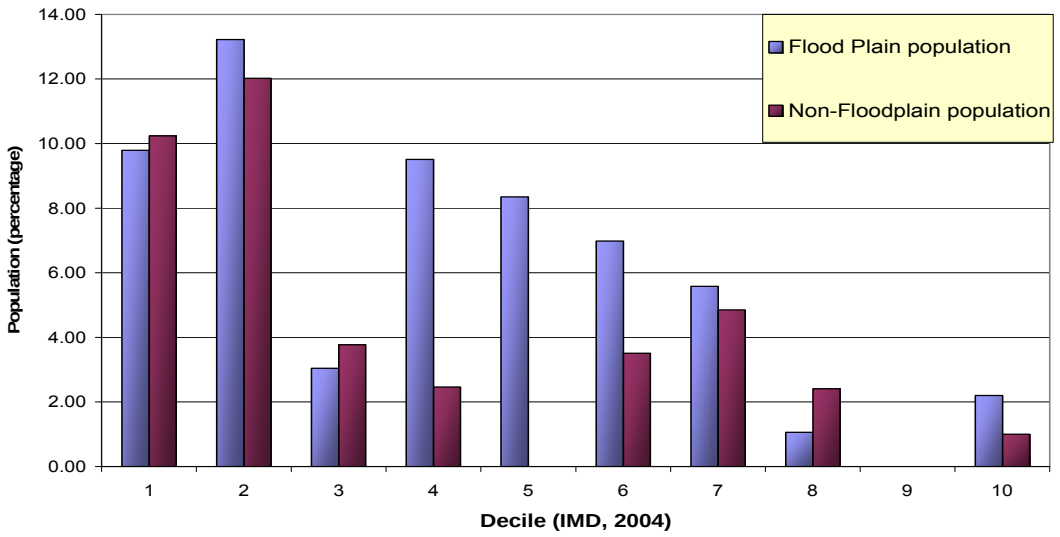
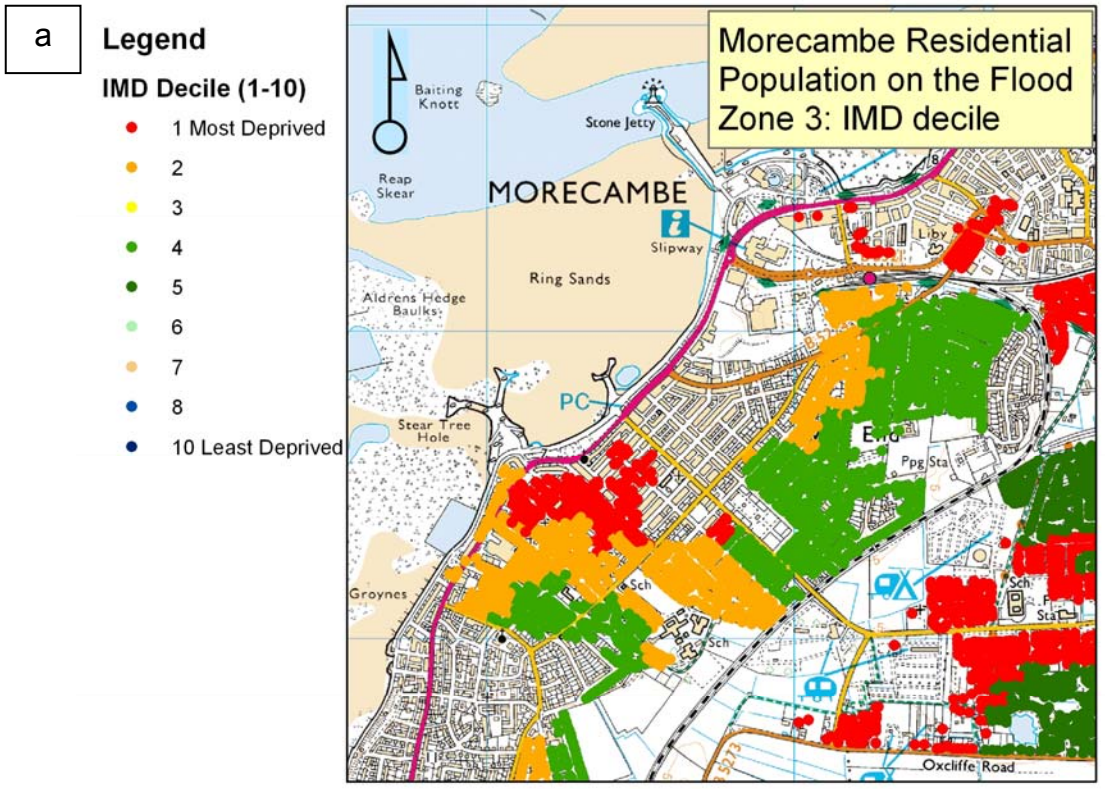
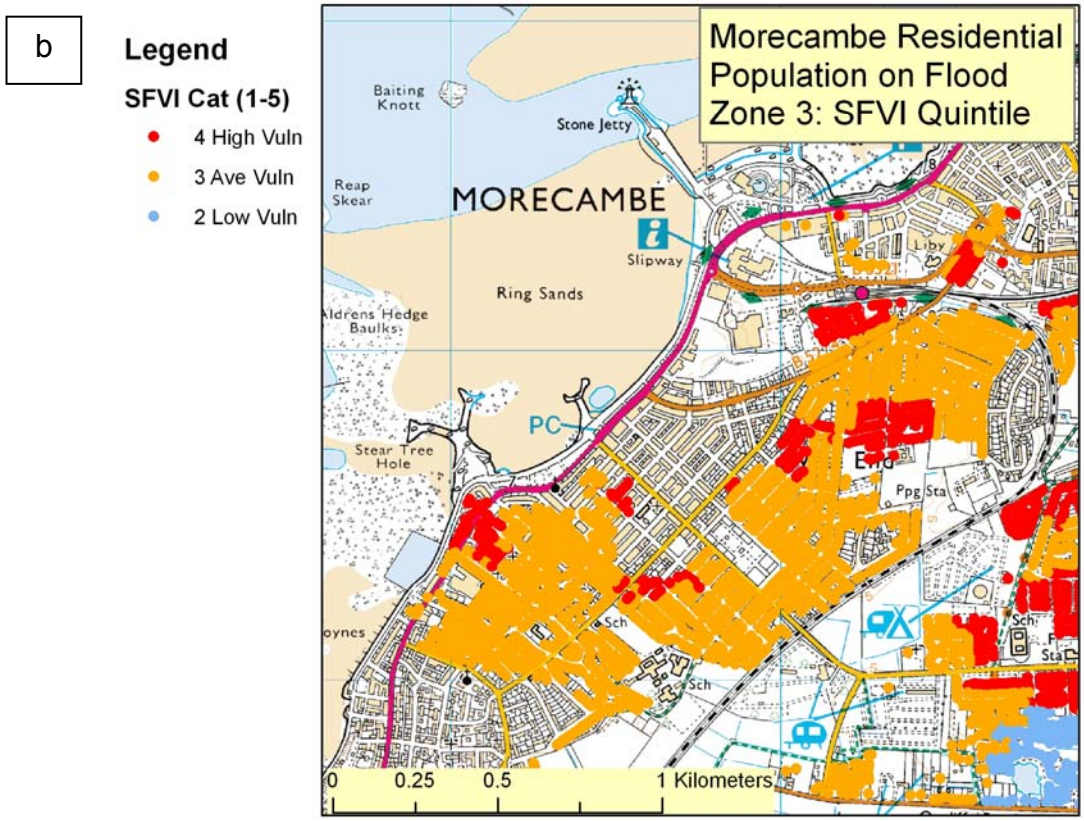


Figure 5.5a shows the IMD categorisations of the households situated in the West End of the town. This part of the town was selected as a case-study site, due to its exposure to sea-flooding and to these relatively high levels of multiple deprivation exhibited by its population.

SFVI categorisation of these households reveals a range of flood vulnerability across this part of the town (Figure 5.5b). On average it could be suggested that this town displays the least amount of flood vulnerability of the three case-study sites, because the majority of the population in these SOAs falls within the index's level of average vulnerability (Cat 3). However, in the West End of the town it can also be seen that there are a number of SOA fragments falling within the limits of the floodplain that are categorised with higher levels of vulnerability.

Figure 5.5: Morecambe: Categorisations of population (a) multiple deprivation and (b) social flood vulnerability, at Super Output Area resolution. Map © Crown Copyright OS 1:25,000 Colour Raster 2007. An Ordnance Survey/EDINA supplied service





5.6 Site Selection Evaluation and Conclusions

In this chapter, the cultural history of three towns has been reviewed and a broad range of literature has been used to provide information about their flood history. Future plans for the protection of the towns from flood hazards have also been discussed, through reference to contemporary flood-risk management documents.

Application of the sample-selection methods (Section 4.4) has revealed characteristics of the towns' populations in map form. From a flood-risk perspective, these populations have all been categorised with average or above-average levels of social flood vulnerability. Quantified levels of multiple deprivation in these towns have also been shown to range from average to the highest levels, in comparison to the national mean. Whilst the results from these two datasets have been broadly similar, in Section 5.4.4.1 a discrepancy between the categorisations was discussed. Having found this discrepancy, it was decided that in order to minimise confusion, it would be appropriate to focus on either one index or the other when interpreting data. Due to fact that the research aim is so flood specific, it was, therefore, decided that all further analyses would concentrate on the designed-for-purpose SFVI, rather than the more complex multiple-deprivation focused IMD.

Accordingly, on the basis of their SFVI characterisation, the towns of Mablethorpe, Cleveleys and Morecambe were selected as the project case-study sites. Following their selection, the survey was conducted in these towns and Chapter 6 will now commence to describe the process of data analysis that followed.

6 Measures of Vulnerability and the Presence of Social Capital

6.1 Introduction

Previous chapters have now set the context of the investigation, defined the research aim, described the methods to be used and introduced the sample population. This chapter will now start to report the results of the survey data analysis. The chapter is split into two main sections, which are each founded on the use of quantitative rather than qualitative data analysis techniques. The first section commences the analysis phase by discussing key demographic variables within the survey data. Particular variables have been chosen for this analysis because they have been suggested, in other research, to be potential indicators of flood vulnerability (see Section 4.3). Once these sample characteristics have been described, the second section will investigate evidence that might indicate the presence of informal social networking and / or social capital within the population. Overall, the analyses in this chapter will constitute the quantitative evidence with which to achieve the first two project objectives. Following chapters will then build on this foundation by adding research depth to these findings. In effect, the analyses performed in this chapter will be contextualised and grounded using the respondents' own, more qualitative, perceptions of personal and community vulnerability, agency and social cohesion.

6.2 Demographic and Social Flood Vulnerability Characteristics: A Quantitative Assessment

This first chapter section will detail some of the samples' key demographic characteristics. Particular emphasis will be placed on describing variables that have been previously used, within the Social Flood Vulnerability Index (SFVI), as census-

derived indicators of vulnerability to flooding. This analysis is undertaken with the specific intention of achieving the first project objective:

> **Objective 1a**: To identify patterns of flood vulnerability within three exposed coastal populations

In Section 4.3.1 it was explained that the SFVI has been used to categorise the population of England, at census Super-Output Area (SOA) resolution, on a 1-5 (low-high) scale of flood vulnerability. It was also explained that each SOA in the case-study towns has already been attributed an SFVI category. However, Walker *et al.* (2006), point out that aggregation of data at any census-area resolution can be contentious. This is because such categorisation can mask evidence of intra-area variability (i.e. there may be minor concentrations of less or more vulnerable households within an area than that area's aggregated index categorisation suggests). In this project, rather than relying purely on the SFVI macro-characterisation of the population, the analysis will reveal how the particular variables are specifically manifested within each town sample. As a result, any need to make an assumption that these samples are simply representative of this aggregated SOA classification will be negated. Analysing the sample on a case by case basis may also be useful in determining how certain characteristics prove influential, for some populations more than for others, in determining flood vulnerability. Such factors might not be so easy to extract using each population's macro-SFVI categorisation alone.

The SFVI is made up of seven census-derived variables. As was detailed in Section 4.3.1, three of these variables count as distinct indicators of vulnerability and the remaining four are used in combination as an indicator of financial deprivation. Whilst the four-indicator set is combined and transformed, expressly in order that 'financial deprivation' does not overwhelm the other, more physical, vulnerability indicators (i.e.

aged over 74years; limiting long-term illness and lone-parent households), they are not arbitrary. Each of these variables can also be said to be an indicator of a particular aspect of flood vulnerability in its own right (e.g. non-home owners are less likely to have insurance than are owner-occupiers). By using items in the questionnaire survey, which identified how each variable was represented in each household surveyed, it has been possible to build a detailed picture of how vulnerability is quantitatively expressed and distributed across the sample population. These variables will now be discussed in detail, before the results of their aggregation is revealed in a section summary.

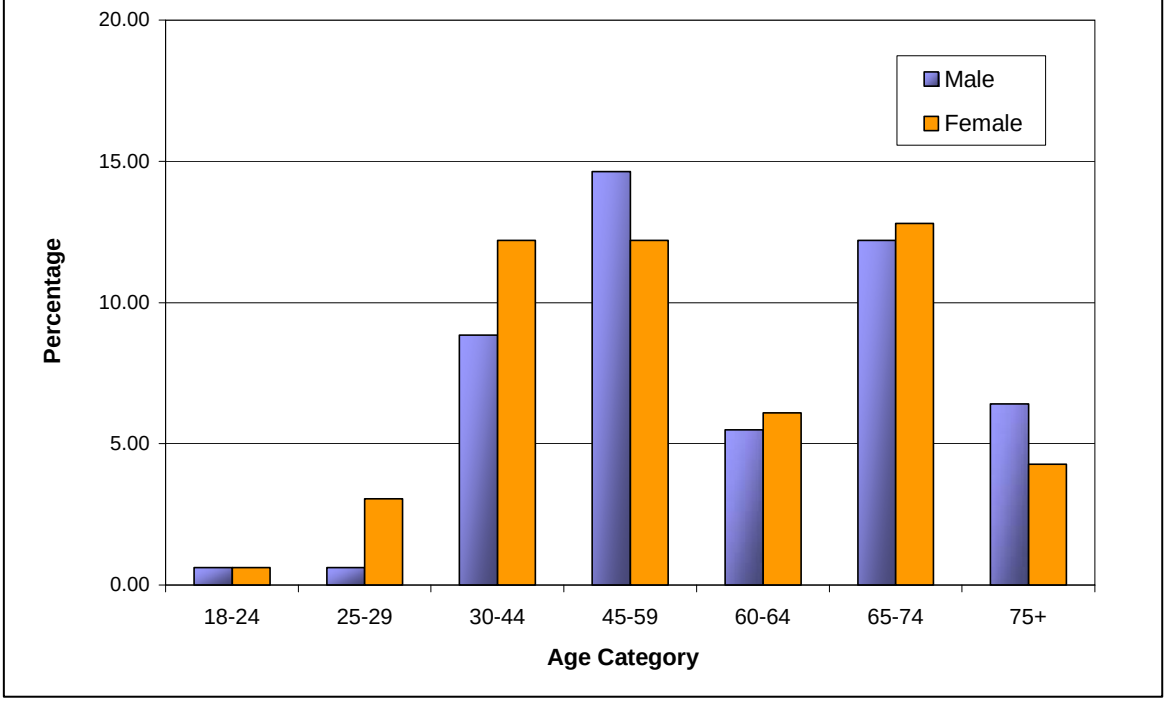
6.2.1 Age and Gender

Age and gender are not SFVI indicators *per se.* However, the discussion in Section 2.2.1 revealed that age can play a role in determining both an individual's risk perceptions and his / her feelings of self-efficacy. Whilst it was pointed out that taxonomic categorisation is not without its problems, gender too, was discussed as an influence on both risk awareness and risk response. In the survey, respondents' ages were categorised using the UK Census age stratification system (as suggested by Fielding *et al.*, 2007). It was found that respondents' age was not uniformly spread across the age range, with only 16 individuals under the age of 30 participating (i.e. 4.6% of total). The mean and median ages in the total sample both fell within the 45-59 age group but when analysed by town, Morecambe exhibited the lowest group-related mean (30-44yrs) and Cleveleys the highest (60-64yrs). In relation to gender, analysis revealed that the sample was almost equally split between males and females (Figure 6.1).

Whilst not being concerned with all age groups, the SFVI does dictate that individuals aged over 74 years should be considered as vulnerable *per se*. Accordingly, respondents were asked to indicate both their own age and whether they shared their

residence with someone aged over 74 years. When these two items were combined 14.8% (49) of the surveyed households contained one or more persons over that age. The distribution of these households was uneven, however, with Morecambe having the lowest sample percentage (6.4%) and Cleveleys the highest (21.4%) (Table 6.1).

Figure 6.1: Age Structure of sample



Mablethorpe	Cleveleys	Morecambe
15.1	21.4	6.4

Table 6.1: Percentage of households comprising one or more persons over 74 years of age in each sub-sample

6.2.2 Limiting long-term illness (LLTI)

Limiting long-term illness (LLTI) is a discrete census-derived SFVI indicator of vulnerability. Whilst each respondent's understanding of what constitutes an LLTI is self defined, the survey item was phrased almost identically to that in the national census (NAO, 2001). Therefore, correlation between the survey and the census could be expected (notwithstanding, the effects of population migration in the seven years since the 2001 census was conducted, and that some individuals' personal health status will invariably have changed). The analysis of this project's survey question revealed that each town had a particular LLTI profile. Of the ~95% of respondents who answered the question in each town, Mablethorpe respondents reported the highest number of households containing an LLTI sufferer (57.6%) and Morecambe the lowest (25.3%) (Table 6.2). The Mablethorpe population's apparently high incidence of long-term illness might seem particularly high, however, in the 2001 census the town was formally acknowledged to have twice the national average of individuals suffering chronic medical conditions (36.58%) (see Table 5.2). Whilst this can be taken into consideration, it is also possible that an additional concentration of sufferers, above the already elevated average, may have been recruited to the survey through the slightly modified sampling strategy that was used in this town due to ethical concerns (see Section 4.4.6).

Mablethorpe	Cleveleys	Morecambe
57.6	41.4	25.3

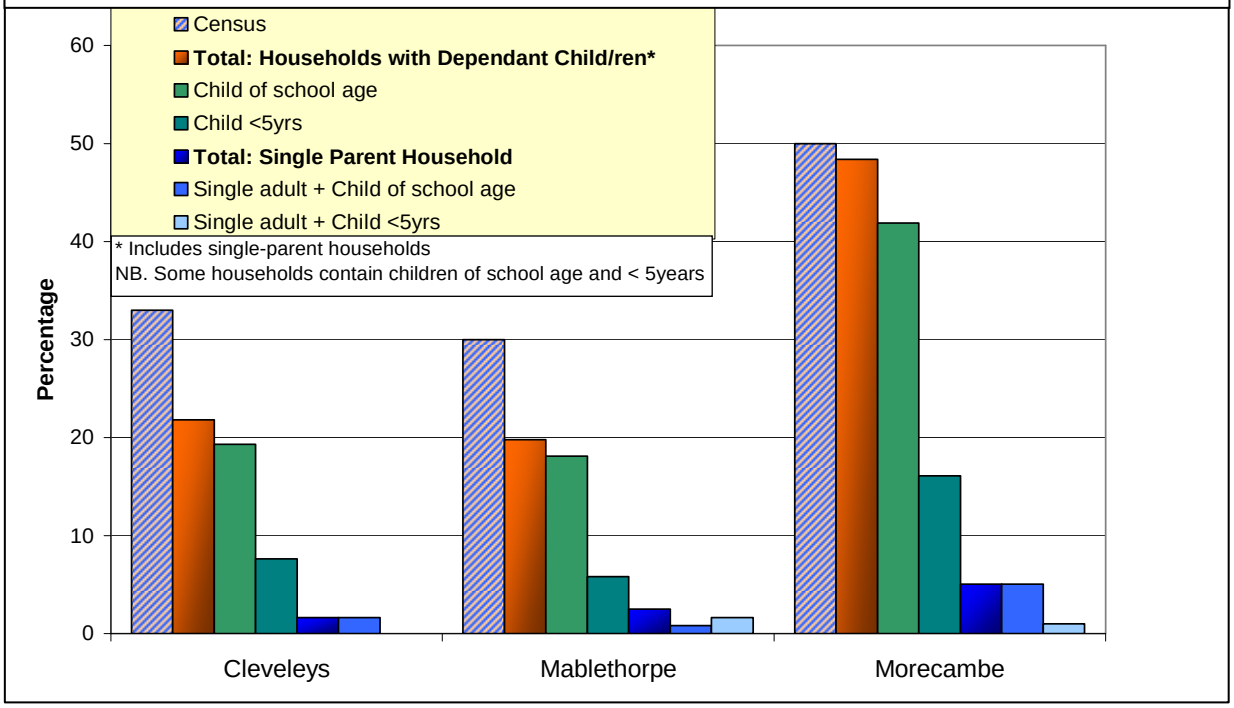
Table 6.2: Households with occupant suffering from long-term limiting illness.

6.2.3 Dependant children and lone-parent households

Whilst the SFVI concentrates on lone-parent households, it has been suggested that all households that contain dependant children can be regarded as vulnerable (Steinführer

& Kuhlicke, 2007). This is due to the extra considerations that parents and carers are forced to take in children's regard during an emergency and the fact that children can be traumatised by the upheaval of their routines (Fordham & Ketteridge, 1995; Peek & Fothergill, 2006). Households where lone parents are solely responsible for their child/rens' welfare are, however, suggested to be extremely vulnerable (Thrush *et al.*, 2005): it is for this reason that lone-parent households are included within the SFVI. In the general analysis of households with dependant children (classified here as being of school age or below), an apparent reversal occurs, relative to the findings regarding age, gender and limiting illness. Figure 6.2 shows that in Morecambe there is the highest overall incidence of, both, households with dependant children (48.4%), and the highest percentage of lone-parent households (5%); the latter being slightly below the regional average of 7.7% (ONS, 2007). Whilst the difference between the samples in this town and the two others is in the order of 30%, note that the 2001 census revealed only a slightly smaller (~20%) disparity (*ibid.*).

Figure 6.2: Households containing dependant children and lone-parent households: Census and sample



6.2.4 Housing tenure and occupancy

In the SFVI, two housing-related variables are used as financial deprivation indicators; tenancy and overcrowding. However, these variables should not just be considered in their financial sense alone. For example, in relation to flooding, it has been suggested that non-home owners can be particularly vulnerable to flood impacts, in comparison to owner occupiers (Burby *et al.*, 2003). Analysis of the research sample found owner occupation to be the highest recorded category of tenure. Cleveleys, for example, returned 93% owner-occupation (Table 6.3). However, whilst owner-occupancy was also high in the other towns, the tenancy rate did exceed 25% in Mablethorpe and 13% in Morecambe. Whilst it is unclear what the, 'Other', definition means in this context[1], this category is also considered as 'non-home ownership'. From this perspective these individuals, as with formal tenants, would be considered as having limited influence or incentive to implement property-scale flood mitigation measures (Burby *et al.*, 2003). They would also be regarded as being less likely to seek insurance cover than would owner occupiers (*ibid.*).

	Mablethorpe %	Cleveleys %	Morecambe %
Owner Occupier	71	93	86
Tenant: Private Sector	11	4	12
Tenant: Social or Housing Assoc.	15	1	1
Other	3	2	1

Table 6.3: Housing tenure by percentage of town sample.

From a recovery perspective, revealing the split of tenancies between private sector and social housing is useful, because an individual's tenancy type can often dictate the consequences they experience. For example, it has been reported that those in social

[1] *NB.* originally the author anticipated that the 'Other' category could be used as an option by, for example, adult children still residing with parents

housing can be sent 'from pillar to post' in the aftermath of a flood, with little choice as to where they are accommodated (Fordham & Ketteridge, 1995). Also, private landlords can find it hard to organise repairs, or they can, sometimes cynically, lack the incentive to expedite repairs on their tenants' behalf (Dash *et al.*, 1997). Tenancy does not, however, always result in negative experiences. For example, it has been shown that large 'landlord' local-authorities or housing associations do have the capacity to implement rapid and effective repair strategies (Ryley, 2007). It has even been suggested that such organisations have been perceived to have prioritised the return of their tenants to some sense of 'normalcy', at the expense of other equally affected, private tenants and owner occupiers (Pitt, 2008). In these samples, the highest ratio of social housing / private tenancy is found in Mablethorpe (15% / 11%) and the lowest in Morecambe (1% / 12%).

Household overcrowding can be an indicator of financial stress. Accordingly, whilst overcrowding in the north of England stands at only ~1.8 per cent (DCLG, 2006), this indicator is included within the SFVI. In the census, household overcrowding is identified when there is more than one person per room within a residence (Tapsell *et al.*, 2002). In this project two items were used to define this variable; "How many people live in your household?" and "How many bedrooms does your property have?" When the responses to these items were cross tabulated, it was found that 'overcrowding' (i.e. here defined, somewhat arbitrarily[2], as 'bedroom' sharing by more than one person in every room) was only apparent in a small percentage of households; in line with the regional statistic. In Cleveleys and Mablethorpe the maximum ratio of people to bedrooms was 2.0, with means of 0.9 and 1 respectively. In Morecambe, whilst the maximum ratio recorded was

[2] The author admits to not recording this variable as effectively as was possible. It would have been much more sensible, from an analytical perspective, to use the census methodology to calculate overcrowding (i.e. total number of rooms / occupants).

2.7, the mean was also 1. It is impossible to assess the subjective classification of what constitutes 'undesirable' bedroom sharing within this sample. However, it is suggested here that if every bedroom in a residence is shared by one or more persons then this household can be regarded as overcrowded. Using this classificatory assumption, only five households in the sample were categorised as overcrowded (1.6%)[3].

6.2.5 Vehicle availability

Another indicator of financial deprivation within the SFVI is a household's lack of access to a vehicle. In the context of extreme flooding, however, lack of access to a vehicle also has another more subjective interpretation. The formal "move to safety" flood warning advice given to householders by the Environment Agency is not generally considered to be a call to evacuate (Twigger-Ross, 2007). However, during this project a number of participants suggested that their response to an imminent flood would be to, for example:

> MrM1_02: "… you know, get stuff upstairs and get in campervan and go and you know just drive to higher ground really"

Access to a vehicle was, therefore, viewed in this project as being not just an indicator of financial wealth, but also as a potential response measure (Section 7.5.2). Table 6.4 shows the degree of vehicle availability across the three samples.

"Is there a car or van available to you?"		Mablethorpe %	Cleveleys %	Morecambe %
	Yes	91.6	89.1	79.6
	No	8.4	10.9	20.4

Table 6.4: Household vehicle availability

[3] Not including two adults cohabiting in a one-bed residence

Lack of access to a car or van can be seen to be most pronounced in Morecambe (20.4%). Conversely, it is Mablethorpe that had the lowest percentage of households with no access to a vehicle (8.4%). Perhaps this is an indicator of the particular requirement for personal transport which is placed on Mablethorpe's residents? Due to their peripheral location away from urban centres there is a suggestion that this population could be considered as being disproportionately isolated from many social, cultural and even essential amenities. For instance, a key informant gave an example of his difficulty in finding a local dentist:

> Key_Mb04: "I go to Boston [32 miles] … my dentist since I was a child is in Boston. I've kept that dentist because that's the only way that I can get NHS dentistry."

6.2.6 Employment status

The final SFVI indicator of financial deprivation is unemployment. This indicator is used because households under financial strain brought about by unemployment are regarded as being less able to cope with disasters (Thrush *et al.*, 2005). However, during the analysis for this project it was realised that simply using 'unemployment' as an indicator of flood vulnerability appeared to be a relatively simplistic approach. The survey item used to quantify this variable (Q.32), gave each respondent a number of options with which to describe their employment status (as does the census survey itself: NAO, 2001), only one of which relates to full time work.

Whilst the highest rate of unemployment was reported in Mablethorpe (5.9%), this town also had the highest number of retired people (56.3%). Morecambe, by contrast, returned the highest number of respondents in full-time employment (45.7%). The lowest unemployment rate of 0.8% was recorded in Cleveleys (Table 6.5).

	Mablethorpe	Cleveleys	Morecambe
Full time	10.9	25.2	45.7
Part time	11.8	16.8	18.1
Unemployed	5.9	0.8	2.1
Retired	56.3	53.8	24.5
Incapacitated	10.1	0.8	8.5
Other	5.0	2.5	1.1

Table 6.5: Survey item 32. Employment status by town and category.

It is agreed that 'unemployment' does have an inhered association with financial hardship (Green, 1997). However, those in coastal communities who are reliant on part-time work, retirement pensions (which may be generous, or may not), incapacity benefit or some undefined 'other' source of income, may also be suffering from equal or greater financial burdens (Beatty & Fothergill, 2003). For example, it has been suggested that in the aftermath of a disaster, part-time employment opportunities can become unstable, as employers reduce their overheads to speed recovery, or move away from the hazard zone completely (Morrow, 1999). All of these alternative employment options were reported more often across the sample than was 'unemployment' (except in Morecambe's 'other' category). However, how each individual's status might have influenced his/her household risk management strategies differently, had these people considered themselves as 'unemployed', is essentially indeterminable. For example, consider flood insurance. Analysis revealed that 80 per cent of 'unemployed' respondents also indicated that they had no flood insurance or were unsure as to whether they had it (n = 10). However, 48% of the 'incapacitated' (n = 21) and 43% of the part-time employed (n = 51) also reported similar circumstances. One factor, which

is revealed by this particular cross tabulation, however, is that of those self-categorising as 'retired', 73.1% indicated that they were definitely insured against flood risks (n = 145). This is the highest positive response in this category and goes some way to ameliorating the fear, advanced by the Association of British Insurers (ABI, 2006), that the retired coastal population may be disproportionately vulnerable to flood impacts, due to their inability or unwillingness to pay flood insurance premiums (see also Section 8.2.1.1). Another factor to remember, in relation to unemployment in particular, is that Fielding *et al.* (2007), reported that the influence of unemployment was not significant in its power to predict household responses to flood warnings. In all cases, up to but excepting 'severe' flood warnings, the unemployed were found to respond as effectively as the employed.

6.3 Demographic and Flood Vulnerability Characteristics: A Summary

This chapter section has investigated data relating to a number of particular demographic variables and census-derived indicators of flood vulnerability. This has been carried out specifically in order to address this project's first objective; to determine the existence of flood vulnerability within the population. In carrying out a quantitative analysis, it has been found that the survey sample represented an equal gender mix, but that younger age groups were slightly under-represented in the sample. In relation to individuals over the age of 74 years (who are considered as being vulnerable *per se*), it was found that 15% and 21% of households in Mablethorpe and Cleveleys, respectively, contained one or more individuals in this age group, compared to only 6% in Morecambe. This difference between sub-populations was significant ($p < 0.001$). In relation to limiting long-term illness, again differences between the sub-populations were

significant ($p < 0.001$). In Mablethorpe, over 57% of the respondents reported a LLTI in their household.

Investigating the presence of children within households, revealed a concentration, of both pre-school and school-aged children in Morecambe, which was significantly higher than the other towns ($p < 0.001$). The number of lone-parent households in Morecambe, whilst relatively low (in comparison to regional analyses), was 50% higher than reported in the other towns combined; but with no significance. Indicators associated with financial deprivation (i.e. tenure, overcrowding, vehicle availability and employment status), were also discussed. Over all, high rates of owner-occupancy were reported across the sample, with apparently significant sub-sample variation in the prevalence of tenancies (χ^*), who accounted for between 5% (Cleveleys) and 29% (Mablethorpe) of households. Overcrowding was identified, in this analysis, as affecting only 1.6% of households. Household access to a vehicle was briefly discussed from two perspectives; the first being that lack of vehicle availability is an indicator of financial deprivation, the second that lack of availability could be perceived as a barrier to a household's capacity to respond to a flood. Regardless of the context, Morecambe returned the highest number of households without access to a car or van ($p < 0.05$).

In relation to employment status, an argument was put forward that the simple classification of the 'unemployed' as being particularly vulnerable (as compared to certain other status categories) was simplistic. It was posited that these other categories of employment, or unemployment, also had the potential to influence a household's responsive capacity. However, it was revealed that those who are retired need not necessarily be regarded as particularly vulnerable from at least one perspective; this group reported the highest rates of insurance coverage in the whole sample (χ^*).

Viewing the demographic variables in conjunction, it is clear that the three sub-samples each express particular patterns of 'vulnerability', as it would be defined through SFVI analysis. Mablethorpe and Cleveleys have slightly older populations and, therefore, their vulnerabilities are defined by old age and limiting illness. Unlike Cleveleys, the tenancy rate in Mablethorpe is relatively high, which introduces another potential vulnerability factor to that population. However, there appear to be certain indications of potential resilience within these particular populations (i.e. insurance). Conversely, the Morecambe sample is slightly younger and comprises a significantly lower percentage of long-term ill. However, this town has a higher prevalence of dependant children and lone-parent households. Analyses of the indicators of financial deprivation in this town also reveal contradictions. Morecambe has the highest rates of formal employment and the lowest unemployment. However, if it is to be used as an indicator of wealth, this sample also has the lowest rate of household vehicle availability. This could be an indication of one of at least two phenomena, 1) although these respondents are employed, they may be on a relatively low wage and, therefore, a vehicle is not considered affordable, or 2) the level of amenities in the town's near environs are such that car ownership is not as requisite as it may be in other towns by people on similar incomes. Whether either of these suggestions is correct cannot be ascertained with these data.

Analysis thus far then, suggests that vulnerability to flooding is present in the sample populations; the first project objective has been achieved. Finally, however, as this chapter section has been focused on specific indicators that have been used in Tapsell *et al.'s* (2002) SFVI, it seems appropriate to illustrate how the samples compare when these variables are illustrated graphically. In Figure 6.3 the seven SFVI variables have been projected, as a series of bars. The three vulnerability indicators (i.e. Over 74, LLTI

and lone-parent households) have been combined into a single bar and the four 'financial deprivation' indicators have been projected independently and also in combination. Finally, there is an aggregation of all seven SFVI variables into a single bar. The SFVI methodology has not, however, been followed completely. Whilst the index methodology requires that the four financial indicators are transformed prior to their inclusion in the index, this has not been done in this case. This is because this project data is being presented slightly differently from the standard index.

In applying the SFVI to census data in its original form, it is not possible to calculate the vulnerability of particular households exactly. This is because census data cannot be used as a means to identify any one particular household (ONS, 2008). Instead, the SFVI is calculated by summing and transforming the relevant census information over the whole census area, with national coverage. Accordingly, this process normally results in a single vulnerability classification being assigned to every household within that area (Section 4.3.1). In this project, however, it was possible to use the SPSS software to aggregate the data at the scale of the case household. This has resulted in a detailed image of exactly how the various SFVI indicators combine, or act independently, to make the sample population in each town more or less vulnerable[4]. In effect, by integrating the data rather than summing it, the exact numbers of households affected, by either one or a combination of factors, can be deduced. In Figure 6.3, it can be seen that old age, limiting illness and lone-parenting combine to create the highest levels of vulnerability in each of the three towns. From another perspective, however, it can also be seen that financial deprivation has a more varied influence; especially when

[4] Whilst this information is useful it is important at this point to introduce a particular caveat. Social characteristics revealed in area studies such as the SFVI will always be representative of a concentration of a particular attributes rather than of the full range. Care, therefore, needs to be taken in order to avoid interpreting the characteristics of any individual as being representative of the whole population, i.e. the 'ecological fallacy' (Walker *et al.*, 2006)

considered discretely from the other variables. When applied in this manner, it can be seen that only 3.3% of the Cleveleys sample can be classified as potentially vulnerable on the basis of financial deprivation alone. In Morecambe, by contrast, 20.3% of the population are classified as vulnerable when this combination of variables is added to the three 'physical' indicators.

The detail revealed by this analysis is very useful, not only because it has achieved the first project objective, but because it will also inform the qualitative analyses in later chapters. Having now illustrated that the sample populations can be regarded as vulnerable (at least from a quantitative perspective), the analysis will move on to investigate more of the survey data. The next section will seek to achieve the second project objective by looking for evidence of the existence of social networks and social capital within the three communities. At the end of the chapter the implications for the project, from the revelations of these two sections, will be summarised.

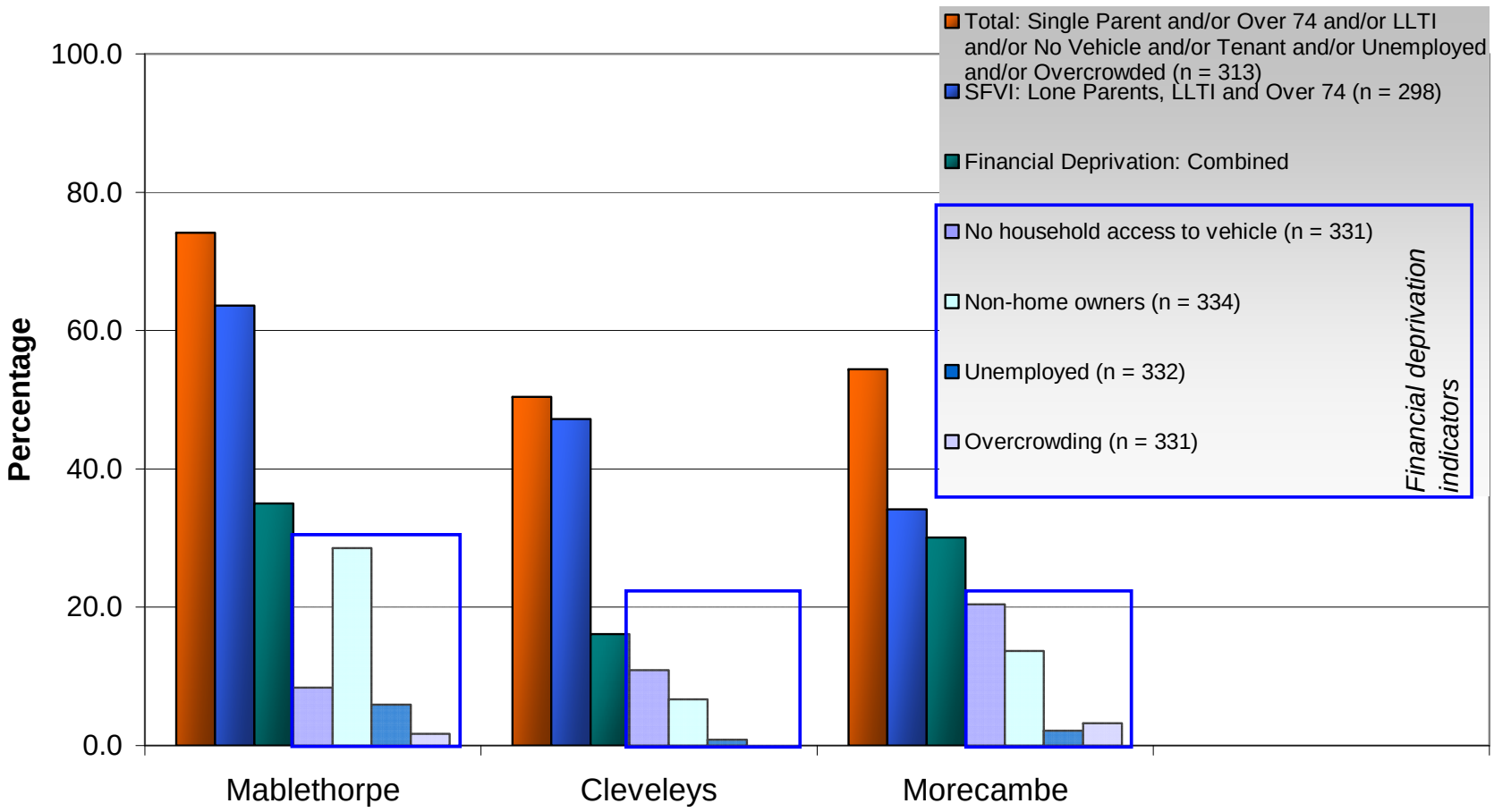


Figure 6.3: Indications of household vulnerability (according to SFVI derived variables) in the three town samples; as revealed by survey responses. See text for details of analysis.

NB. Although some cases are represented within multiple categories, within the totalised column each case is only counted once.

6.4 Social Capital: A Quantitative Assessment

This chapter section details the survey responses that related to the presence of informal social networks and the potential indicators of social capital within the samples. Looking at these variables, as they relate to the samples in each town, will allow the analyses that follow to explore which factors may be the most important in creating network resilience, or the potential for collective action, against a hazard. This section will specifically achieve the second project objective:

> **Objective 1b**: To identify patterns of social capital (in the form of networks, norms and social trust), within the three coastal populations

As was explained in Chapter 3, social capital has been suggested to be created when three particular factors operate in combination within and across a population. The identification of social networks provides a primary key, but within these networks there must also be evidence of social trust and generalised reciprocity between members. Whether these three factors are identifiable within the data will now be explored.

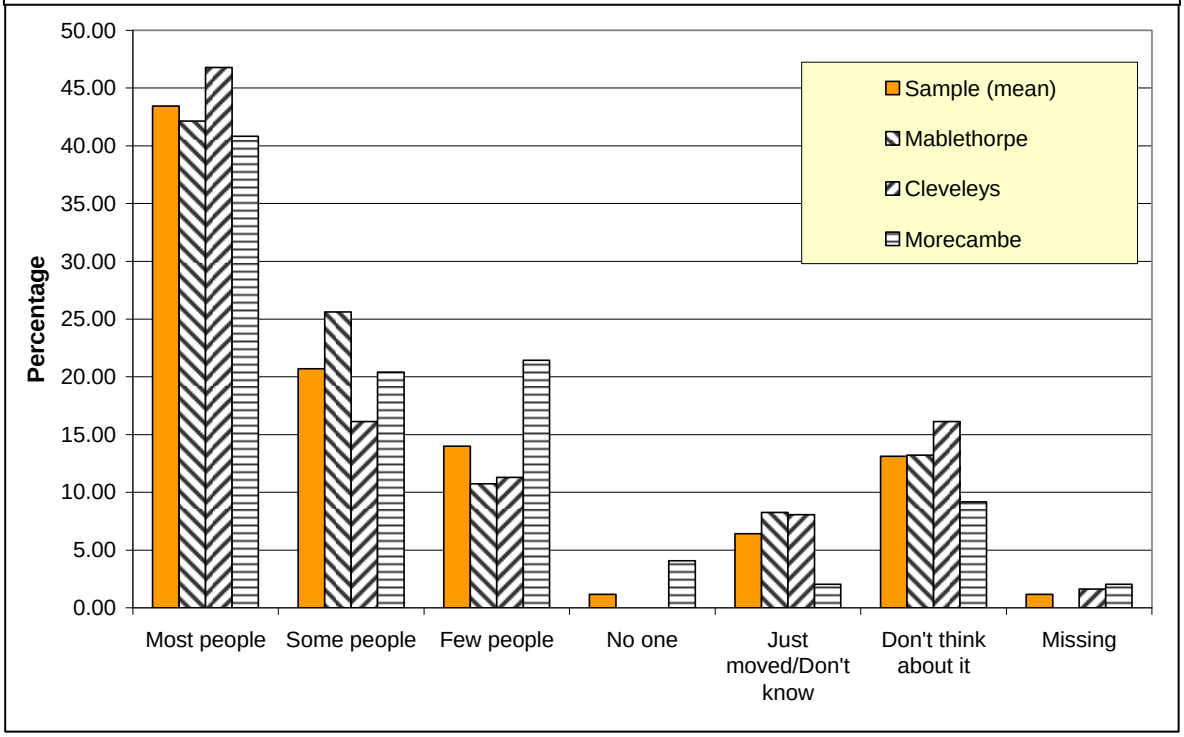
6.4.1 Social trust

Social trust, and in particular each respondent's 'radius of trust', was investigated primarily through the use of a single question item (Q.21). This asked directly for the number of people in 'the street' that the respondent felt that s/he could trust (Figure 6.4).

On looking at Figure 6.4 it can be seen that the highest levels of trust are expressed in 'most people' across the samples. Other categories are relatively evenly represented, with Morecambe respondents indicating more willingness to trust only 'a few' when compared to the other towns. However, there is a tendency toward respondents expressing their ambivalence (rather than negativity) to the subject, i.e. through their use

of the 'Just Moved' or 'I don't think about it' options. That 17% to 24% of the samples returned these impartial responses could indicate that, despite there being a strong core of trust within the sample population, there is also, potentially, a much broader level of scepticism in relation to social values in these towns than in the nation as a whole[5]. Alternatively, the high "I don't think about it" response could be an indication of a particular insularity of thought that is only present in these samples, and should not be considered as being representative of the towns' greater populations. The more detailed, qualitative, analysis of trust issues that will take place in Chapter 8 will discuss these possibilities in more detail.

Figure 6.4: Social trust; expressed by total and by town (*NB.* no difference between towns at $p < 0.05$).



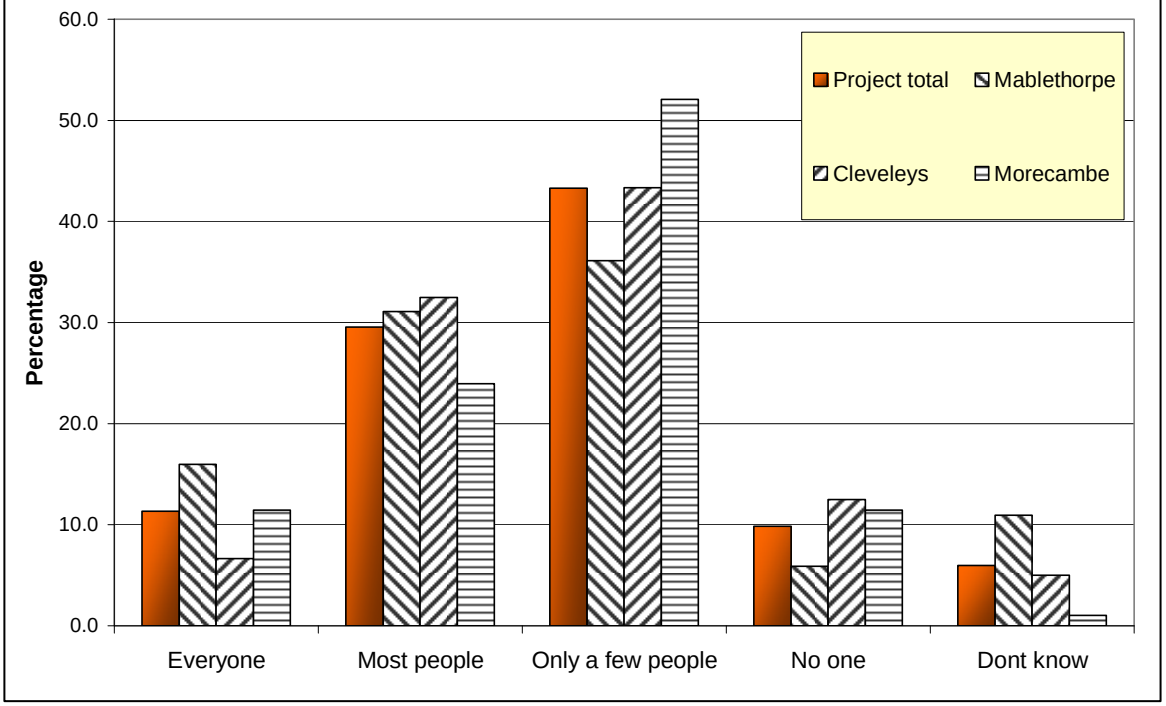
[5] In the British Citizenship Survey (CLG, 2005) only 6.9% of the nationally representative sample gave negative or non-committal responses. However, the BCS did not offer an 'I don't think about it' option.

6.4.2 Generalised reciprocity

> "Trust reinforces norms of generalised reciprocity, but reciprocity is a social attribute through which trust is enacted in interpersonal transfers of information or resources" (Pelling, 2005: p.4).

As Pelling's quotation suggests, reciprocity is considered to be fundamental in the development of social capital (Section 3.1). Specifically, the survey question in this regard focused on identifying the potential for 'brave reciprocity' (Siisiäinen, 2000). Respondents were asked how many people in their street they would feel comfortable asking for the loan of a sink plunger. In effect, this item is designed to investigate the confidence with which respondents would open an obligatory transaction with another person in their street, who, importantly, may be a stranger to them (Harper & Kelly, 2003) (Figure 6.5).

Figure 6.5: Brave reciprocity; expressed by total and by town
(*NB.* no difference between towns at $p < 0.05$)



As can been seen in Figure 6.5, the distribution of responses to this question in the combined sample indicates that almost as many people feel confident that they could borrow a tool from 'everyone' or 'most people' in the street (40.9%) than feel that 'only a few people' could be approached (43.3%); notwithstanding, that the difference between 'most' and 'a few' is subjectively self-defined by the respondent[6]. Those who 'don't know' or who feel unable to approach anybody accounted for only 15.9% of the sample (a very close match to the 17.7% of people who trusted no-one or who didn't think about who they trusted in the earlier question). In looking at the reciprocity and the trust responses in cross-tabulation, whilst the highest levels of social trust were indicated by those people who trusted 'most' others (44%), only 19.7% of those respondents also thought it likely that they could borrow from 'everyone', rather than from 'most' people (43.5%), or from 'only a few' (27.2%). It is, of course, possible that other issues may be affecting this particular relationship. A respondent might, for example, suspect that it would be unlikely that some individuals or 'types' of people would own a plunger and, therefore, these people would not have been included in the respondent's mental deliberation. Only 8.7% of all the respondents were completely ambivalent, in the sense that they neither thought about whom they trusted, nor whom they could approach for a loan. Only 1 person indicated total isolation from the other residents in their street, by giving explicitly negative responses to both items.

When comparing generalised reciprocity with trust, those who feel confident to ask for a loan of equipment are represented by a slightly higher percentage of the sample than express any degree of trust in others (82.5% vs. 78.1%) (Table 6.6).

[6] A similar question appears in the British Social Attitudes Survey 2006 (NATCEN, 2007). However, the respondents in this survey were asked how happy they would be borrowing a plunger 'from their neighbour'. In all, 52.8% stated that they would be very comfortable to do this; 21.4% fairly comfortable; 12.9% fairly or very uncomfortable with 0.7% unsure (*n* = 3,167).

	Trust…	Reciprocity: Borrow from…
Everyone / Most people	43.4	11.3
Some people	20.7	28.9
Only a few people	14.0	42.3
Total	**78.1%**	**82.5%**

Table 6.6: Trust vs. Reciprocity

This would seem to indicate that it is not essential, in this population, to trust someone in order to open a reciprocal arrangement with them, although, there is evidence of a relationship between the two variables in all the towns ($p < 0.001$). However, this relationship does not appear to be straightforward. On closer inspection it can be seen that similar proportions of respondents indicated that they felt that 'only a few' people were suitable to enter into a reciprocal arrangement with, as the number who indicated that they trusted 'most people' (see shaded cells in Table 6.7). This would suggest that although the norms of trust and reciprocity are relatively strong in the communities, entrance into reciprocal arrangements does seem to involve what appears to be an extra 'filter' being applied before the arrangement is considered i.e. one might trust everyone in the street but would only consider borrowing an item from a sub-set of these people. This suggests that the propensity for 'brave reciprocity' is more tightly constrained than it is for social trust. Portes (1998) suggests that entry into reciprocal arrangements necessitates that, by cooperating, individuals become involved in a "*common social structure*". Furthermore, Portes further adds that such a common structure rewards its members with the potential of "*status, honour and approval*" (*ibid.*: p.8). However, there is a clear shrinking of the net, exhibited by this sample, when they are asked who they would deal with in loan-type agreements. This suggests that the potential 'social' rewards, posited by Portes, may not be sufficient to entice these respondents far outside of their existing instantiated and bonded-network relationships (Fukuyama, 2001).

The quantitative aspects of trust and reciprocity have now been discussed. The analysis will now move on to investigate how the levels of trust and reciprocity in the communities are instantiated within the different forms of informal voluntariness, civic engagement and socialising group-activity that occur within and between social networks.

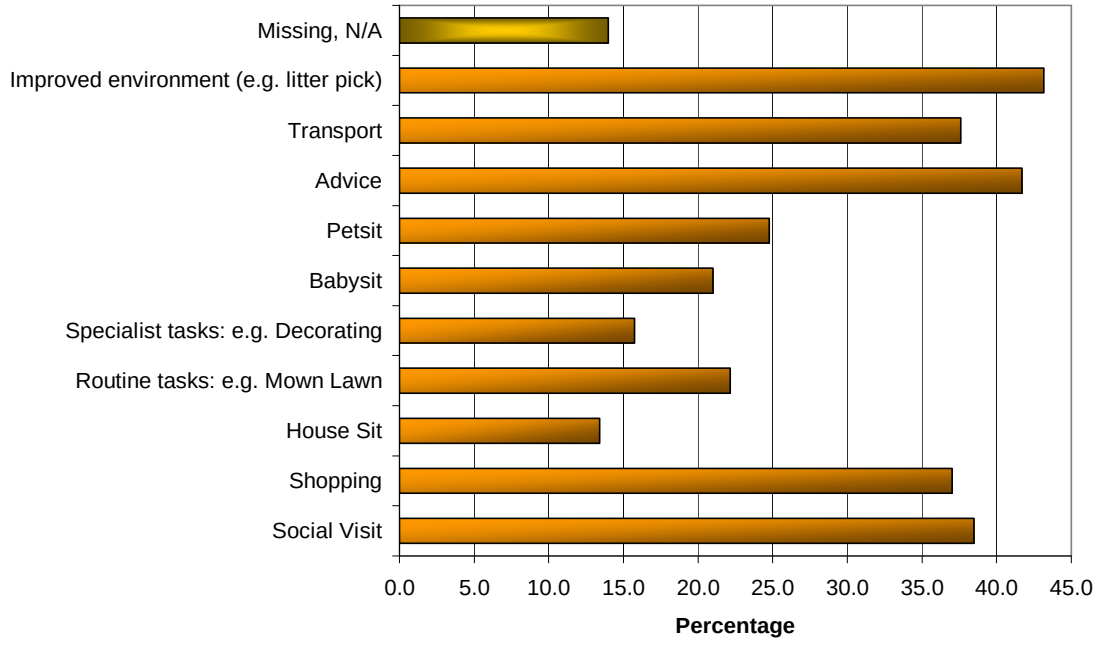
6.4.3 Social networks

In this sub-section three forms of social networking will be investigated. The analysis will take the form of a quantification of what Stone (2001) terms social capital's 'proximal' indicators. In defining proximal indicators, Stone describes network interaction such as, for example, civic engagement, as an outcome of social capital rather than a core component. Therefore, this section will investigate the presence of three aspects of networking: 'good neighbourliness' (Putnam, 1995), civic engagement and membership of formal social groups. How these networking activities balance across the sample will give an indication as to whether the towns' populations, and the individuals within them, could be considered as, for example, socially insular, socially active or hierarchically engaged.

6.4.3.1 Social support ('good neighbourliness')

The item selected to investigate social supportiveness within the samples (Q.18) asked respondents if they had carried out any of a series of activities, unpaid, for people other than close relatives in their town in the last 12 months. Inherent in this question is an interest in social relations which are occurring outside of the respondent's closely bonded family group. Therefore, such activity will be regarded as evidence of bridging social capital. Participation in voluntary activities such as these (e.g. lawn mowing) also indicates a potential for reciprocity (Figure 6.6).

Figure 6.6: Voluntary social support, all towns



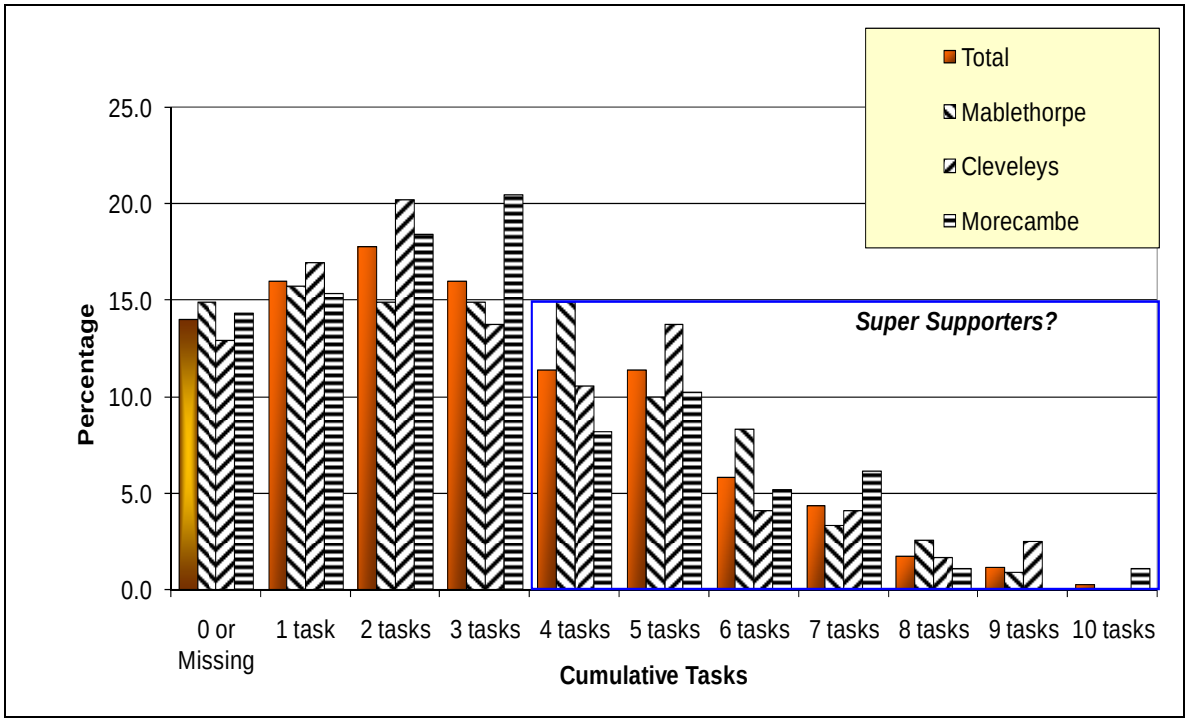
As can be seen from Figure 6.6, there was a high response rate to this question, with only 13.9% of the population indicating that they undertook no voluntary activity at all. The most popular activities were: improving the environment (43.1%) and giving advice (42%). Visiting, shopping and transporting others all returned responses between 30% and 40%. When combined[7], house-sitting, babysitting and pet-sitting were also reported by 42% of responses, whilst routine manual tasks (e.g. lawn mowing), or more skills-intensive labour (e.g. decorating), were reported by 29.4% of respondents.

Figure 6.7 illustrates the number of voluntary tasks undertaken by each respondent. From this it can be seen that within the community there appear to be a number of individuals who could be termed *super-supporters*. Wenger (2000), suggests that

[7] These figures relate to the combined activities performed by an individual e.g. individuals who reported babysitting **and** pet sitting were only counted once.

individuals who undertake above average levels of voluntariness[8], are, potentially, able to generate both trust and reciprocity within their networks by strengthening local norms of mutuality. However, before it can be said that these particular individuals constitute such a resource in these particular communities, there would be a need for further investigation. Whilst it would be alluring to reach such a conclusion, it is hard to tell if these super-supporters truly do have a broad influence across their community at large. Again, the use of a particularly-worded survey item means that it cannot be assessed whether all these individuals' actions were carried out for diverse friends and strangers, or for just a single acquaintance; such as a frail neighbour.

Figure 6.7: Voluntary social support. Cumulative activities per respondent (*NB.* Mean: 3.43; no difference between towns a $p < 0.05$)



[8] For those who did take part in voluntary activity the mean number of actions was 3.43 with a standard deviation of 2.

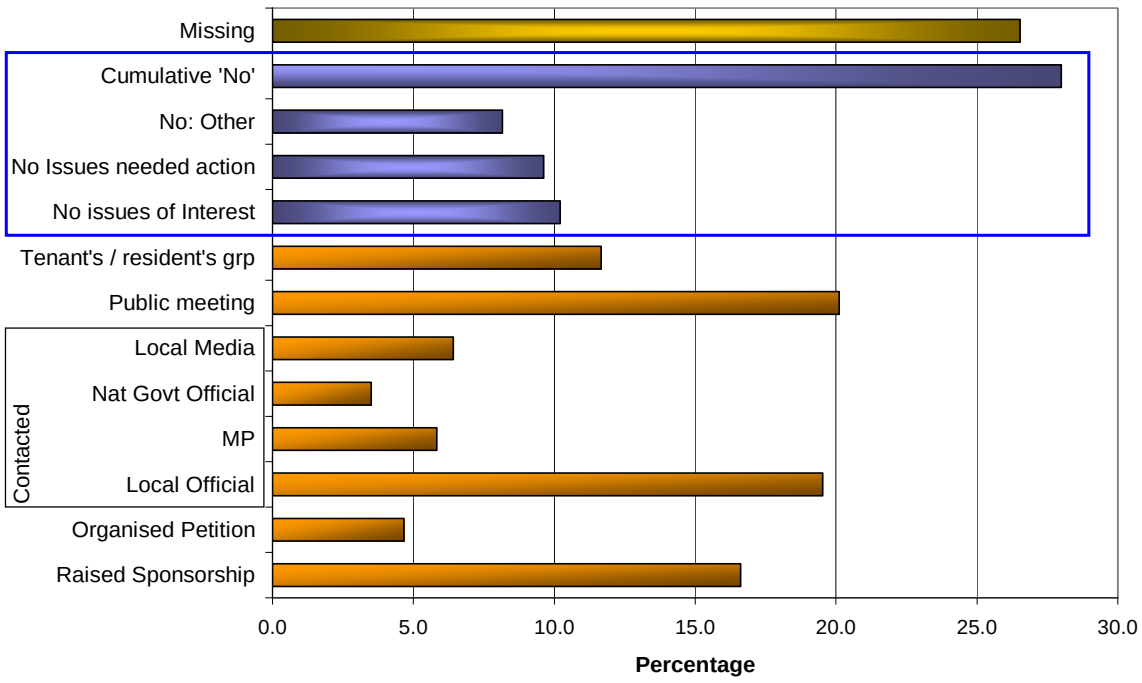
6.4.3.2 Civic engagement

In looking at levels of civic engagement the intention was to examine the nature of 'linking' social capital evident within the sample population. As detailed in Chapter 3, the concept of linking social capital relates to an individual's ability to 'network up' through institutional hierarchies and was described by Putnam (2000) as "sociological WD40". Figure 6.8 shows the breakdown of the reported civically-orientated activity. Whilst such activity does not in itself require a respondent to belong to a 'network' as such (e.g. writing a letter to an MP does not in itself require any personal interaction with that individual), the activities detailed under this category can be understood as being distal indicators of social capital (Stone, 2000). In effect, whilst they are not indicators of social capital *per se,* they do provide an indication of each individual's confidence and their perceived agency, which has allowed them to cross hierarchical boundaries in their community's interest[9].

On inspecting Figure 6.8 it can be seen that missing or negative responses dominate the data. However, whilst an average of 26% of respondents missed the item completely, a further 27% of those who did respond specifically indicated that they had not undertaken any civic actions for particular reasons; e.g. there were no local issues demanding attention, or there were no local issues that interested them. There is the possibility, of course, that there *were* no local issues demanding these individuals' attention. However, this prevalence of hierarchical un-connectivity could also be suggested to be evidence that more than half of the sample population are content to be disengaged from, or feel disenfranchised by, local decision-making institutions. This issue will be considered again in Chapter 8.

[9] *NB*. Whilst it is possible that these actions were undertaken purely in self-interest the survey item was explicit in asking "…have you taken any of the following actions in order to **help with an issue affecting your community** …" [emphasis added]

Figure 6.8: Civic engagement, all towns

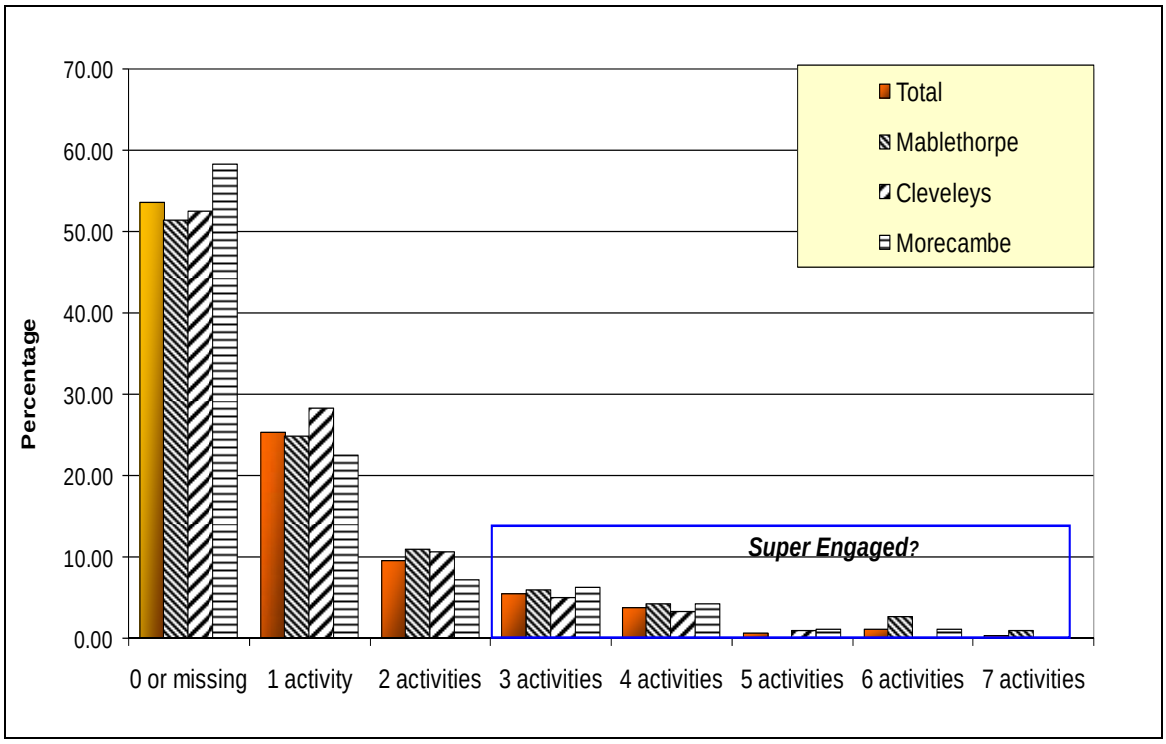


In relation to positive responses to this item, Figure 6.8 indicates that the highest number of responses in relation to engagement were reported as being; 'attending a public meeting' (20.1%), 'contacting a local official' (19.5%) and 'sponsored activity' (16.6%). Attendance at a tenant or residents' group meeting (including Neighbourhood Watch) was reported by 11.7%. In similarity to the findings in relation to social support, the analysis of responses to this item revealed individuals who could be considered as *super-engaged* because they have reported an above average degree of civic engagement (Figure 6.9)[10]. These are individuals who are apparently more prepared than others to utilise multiple governance processes, from organising a petition through

[10] Of the 45% of respondents who did undertake such activity the mean number of civic actions was 1.9 with a standard deviation of 1.2.

to contacting their Member of Parliament, in order to address grievances that they may have.

Figure 6.9: Civic Engagement. Cumulative actions per respondent (*NB.* Mean 1.9; no difference between towns at $p < 0.05$)



The relatively low levels of civic engagement recorded here could be partially attributable to the socio-economic conditions prevalent in the coastal towns. The Home Office Citizenship Survey 2003 revealed that the areas exhibiting the highest numbers of civically-engaged people, on a national scale, were also those classified as containing higher levels of affluence. Affluence was determined in that Government survey by a higher proportion of people within a population who were classified as 'better off executives' or 'wealthy achievers'. It was the 'older, less prosperous' neighbourhoods which consistently returned low levels of engagement (Home Office, 2004). From this perspective this project's survey data, combined with the survey populations' generally

low ranking in the Index of Multiple Deprivation (see Section 4.4), would seem to be in agreement with the pattern identified in the national assessment.

Returning to Coleman's typology (Table 3.1), one can see that the civic engagement that does occur might, in this context, facilitate the formation of social capital in a number of ways. For example, those undertaking hierarchical communication may be more able to gain information about particular issues, in addition to that which is broadcast by other more generic means (e.g. leaflets or newspaper articles). Thus, such individuals could be regarded as information sources by members of more laterally-defined social networks into which they bond or bridge. Also, if these individuals are recognised within the local area as being more prepared to interact with the authorities, then it is possible that they could be relied upon to act as a charismatic leader or negotiator in other authority relations or negotiations. However, a statement by a key informant needs to be used here to clarify some limitations regarding the possible actions and motivations of such individuals:

> Key_Mr02: "You need one particular person to be very active. What I find is [in] all the community groups … there'll be a pivotal figure and if they lose energy then the whole thing dies. They're the ones that have to chase and do all the hard work but normally they have a motivation that is separate to everybody else."

This point is interesting because it implies that community 'leaders' (local champions) can operate with a personal agenda. This would suggest that these individuals', ostensibly civic, actions can be somewhat distinct from actions performed simply with altruistic intent. In relation to these agenda-driven issues, the inference is that once that person's interest wanes or s/he gets as much out of the negotiation process as s/he wants, then it is likely that engagement will decline, regardless of the issue-motivation

levels of the greater community. The role of civically-engaged individuals will be discussed in Section 8.4.

6.4.3.3 Social activity

Putnam's thesis (2000) was built on the premise that associational activity had declined in the US during recent decades (Section 3.1). To investigate the levels of associational activity occurring within this research sample, respondents were asked to indicate what type of formal social groups they belonged to (Figure 6.10).

Figure 6.10: Social engagement and group membership: All towns

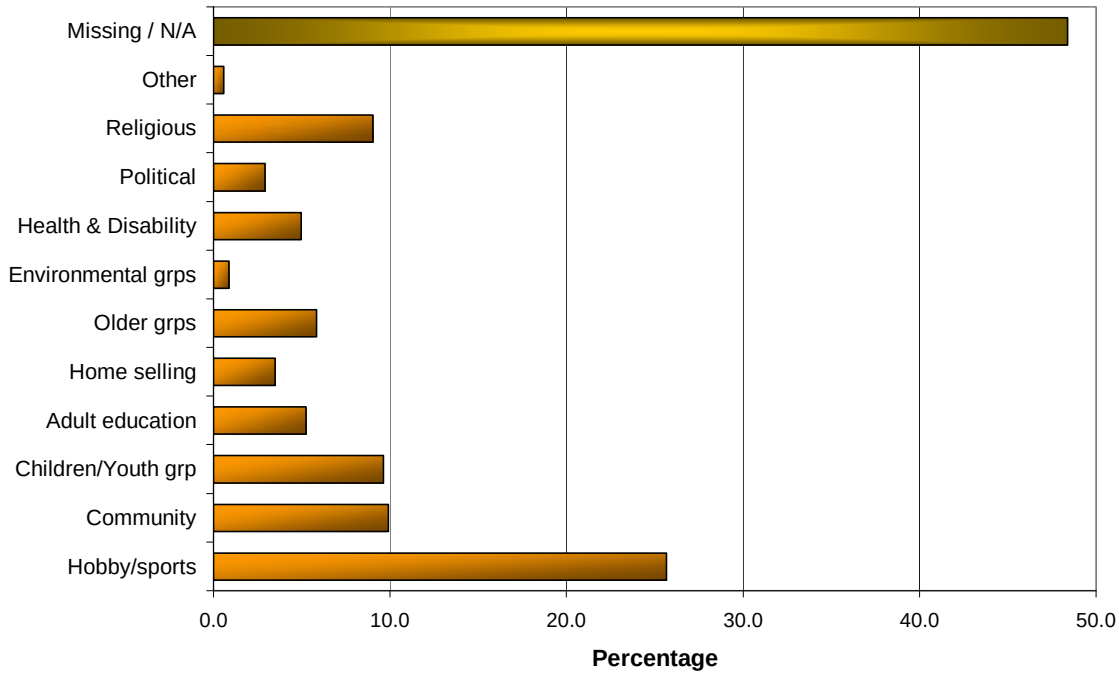
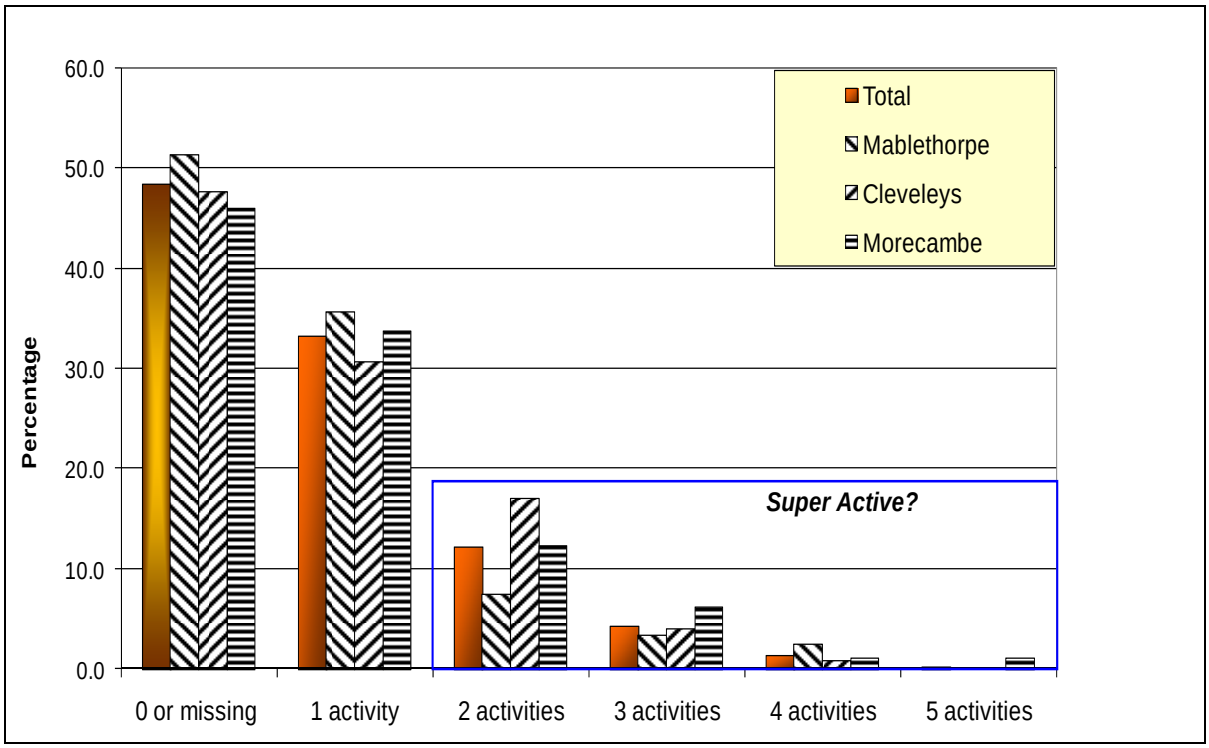


Figure 6.10 shows that the level and variety of group-based social activities undertaken by the respondents is limited. Sports and hobby group memberships record the highest response rate (25.7%), with community, children's' and religious groups each recording

between 9%–10% each. Membership of adult-education groups, groups for older people and health and disability groups ranges from 5%–6%. Inspecting the respondents' activity in aggregation (Figure 6.11), it can be seen that 48.4% of the sample reported no social group membership at all. Of those who did respond, the majority only belonged to a single group (33.2%) and only 18.4% of all respondents indicated involvement in 2 to 5 different groups[11].

Figure 6.11: Social activity. Cumulative actions per respondent (*NB.* mean 1.5; no difference between towns at $p < 0.05$)



Although the idea of a formal group or network could be considered as compelling as an indicator of social capital within a community, there are other considerations to take into

[11] Of the respondents who indicated that they did socially engage with other community members, the mean number of groups to which membership was indicated was 1.5 with a standard deviation of 0.8

account. For instance, Fukuyama (2001) debates the importance of assessing the functional cohesiveness with groups:

> "Unfortunately, there is no accepted method for measuring the internal cohesiveness of groups; each measure of effectiveness would have to be determined subjectively by an outside observer who would note the types of activities the group could undertake and their difficulty, its cohesion under stressful circumstances, and other factors. Despite the subjective nature of its derivation, it is clear that cohesiveness varies across groups and is a critical qualitative measure of social capital." Fukuyama (2001: p.13)

Fukuyama's point has some merit, for indeed the cohesiveness of the social groups reported here can not be ascertained from the survey data. There is also a possibility that some of the associations considered by the respondents are in fact contacts with tertiary organisations, e.g. 'Environmental' and 'Political'. These two groups had membership reported by 3.8% of the sample population. However, if these are tertiary associations, then it cannot be guaranteed that membership is an indicator of local social capital. This is because members could conceivably live next door to each other without ever knowing that their neighbour was also a member (see Section 3.3).

Conversely, the role of some organisations within a community can, according to Coleman (1990), have an important role in developing and structuring norms and obligations, which can have an effect beyond the confines of the particular group membership. Groups formulated to serve religious, community or children's needs, for example, have the capacity to extend norms of trust and reciprocity out across their members' other networks of friends, neighbours and fellow parents (*ibid.*). In this sample 24.2% of responses indicated membership of one group of this kind and a further 4.4% of respondents said they belonged to two such groups.

Having now detailed the networking activity reported by the respondents, one further survey item will be analysed. Within the first series of scaled questions (Q.12) a single item asked whether respondents agreed with the statement "People around here would help each other out if a flood happened". This question is specifically social capital orientated, because it investigates normative attitudes toward the community's potential for collective action. In total, 61% of respondents agreed with the statement, compared to 15% who disagreed. Furthermore, there was a significant relationship ($p < 0.001$) between this result and the trust and reciprocity variables. This suggests that there is an inhered potential, in all the sub-samples, for the creation of a therapeutic community response during a hazard event (see Section 7.5.2.4).

6.5 Social Capital: A Summary

In this chapter section, survey data that might suggest the existence of social trust, generalised reciprocity and three types of social-networking activity have been investigated. This has achieved the second project objective, namely, it has ascertained that social capital can be said to exist in the sample communities. In relation to trust and reciprocity it has been found that 78% of the sample population expressed trust in at least a few people in their street. Furthermore, 82% of respondents stated that they would be prepared to ask at least a few people in their street for the loan of a household implement. These two variables were significantly related. Such high levels of reported social trust and (a slightly more socially constrained) preparedness to enter into reciprocal arrangements with others, suggests that two core components of social capital in the population have been quantified (Stone, 2001). What can be added to this is the related perception, held by a majority of the population, that should a flood occur, then members of the 'community' would render assistance to each other.

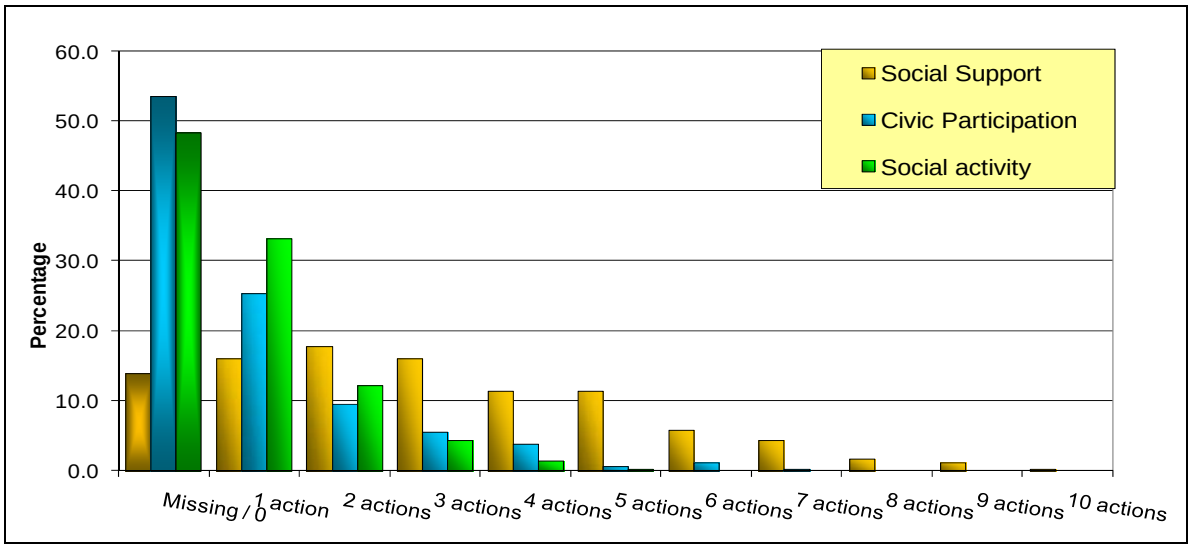
In relation to social networking, evidence supporting the presence of three types of networking activity was described, with each type revealing slightly different patterns of engagement. The highest responses related to the incidence of socially-supportive activity, with 86% of the population reporting their participation in one or more neighbourly actions. In relation to the identification of forms of hierarchical linkage, or participation in activities intended to influence some form of governance institution, these were reported by 46% of the population. In cross tabulation, whilst there is no relationship between civic engagement and trust or reciprocity, there is a relationship between social support and civic engagement ($p < 0.000$). This suggests that those individuals, who are involved in supporting others through voluntariness, are also more likely to engage across hierarchical boundaries in the interests of their community.

Whilst the reports of formal social activity were relatively high (51%), there was one interesting factor related to participation in this type of network. In relation to the total number of separate activities undertaken by each person in this category, the mean number of groups to which respondents belonged was 1.5. This was the lowest average of all three activity types (Social Support, 3.43 and Civic Engagement 1.9) (see Figure 6.12). Overall, the much higher mean participation rate in socially supportive activity suggests that informal, lateral-networking forms the basis of activity for a larger percentage of this population than does membership of formalised groups, or engagement in civic, hierarchically linking, activity.

Also in this analysis the concept of 'super' community members has been introduced. These are regarded as being the respondents who reported taking part in an above average number of activities in each category. The super-category membership in the towns ranges between 31% – 39% for social supporters to 8.9% – 13.2% in relation to

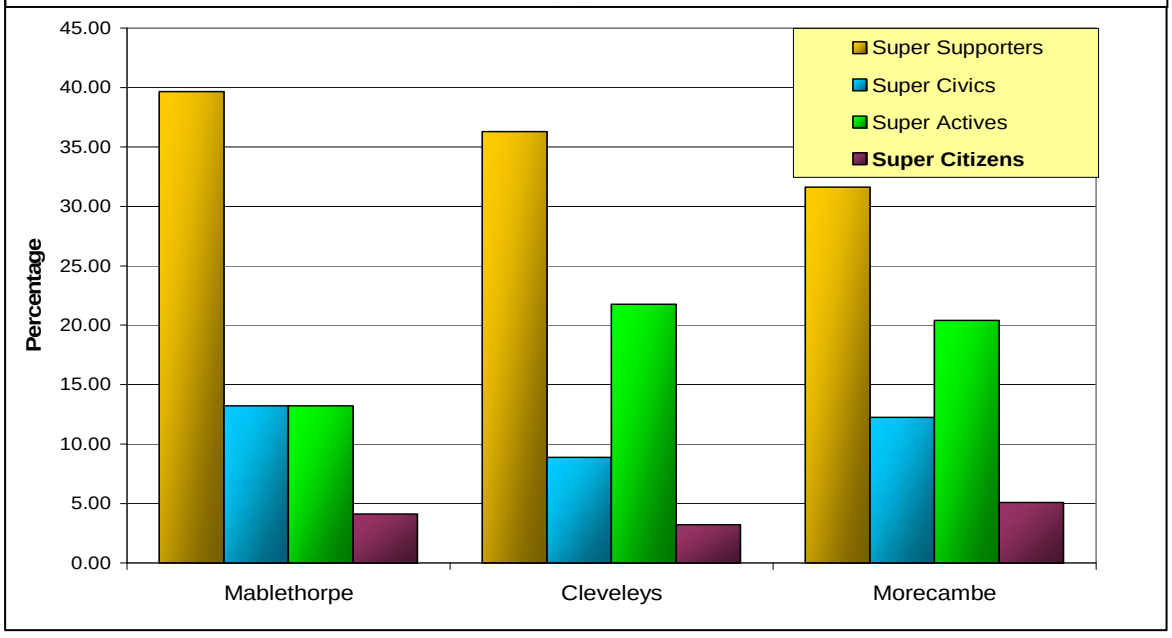
civic engagement. Figure 6.13 shows the frequency of these 'super' individuals within the three categories and also those in a fourth category of 'Super Citizens'. Super Citizens are those individuals who report activity in all three types of networking activity (4% of total). Looking at the statistics in relation to 'Supers', it was found that no relationships existed between any of these categories and age, gender, trust or reciprocity. Although, relationships did exist between those who exhibited 'super' levels of civic engagement, social activity and citizenship, and the reported involvement in formal discussions about flood risk. All these relationships were made statistically weak, however, due of the violation of the Chi-square assumption that a minimum expected cell frequency should be no less than 5 in at least 80% of the cells. In relation to all these 'super' cross-tabulations, up to 66.6% of cells exhibited a frequency of less than 5 (see Appendix 4). That such violations occur across all the analyses of the 'super' categories inevitably undermines the strength of any conclusions that can be drawn from these particular statistics (Pallant, 2001).

Figure 6.12: Social networking activity expressed as the number of activities undertaken by each individual: All towns



However, leaving statistics aside, some of those in the 'Super' categories provided evidence of their engagement with local issues in a far more practical, but less statistically quantifiable manner. Appendix 6 shows that of the 24 individuals who eventually participated in a focus-group discussion, 19 of them had indicated some form of above-average activity in one or more of these categories, or were accompanying a spouse who had (see Section 4.5.3). What this particular phenomenon revealed, about these individuals and community resilience more generally, during the group discussions is discussed in more detail in Section 8.4.3.

Figure 6.13: The respondents in each category of social networking activity who report an above average level of participation. The fourth category 'Super Citizen' relates to those individuals who report participation in all three types of activity.



Taking a wider perspective on the evidence so far, suggests that diverse social networking occurs within these three sub-populations and that its prevalence is statistically related to two core determinants of social capital (trust and reciprocity). Whilst not an exhaustive investigation of the concept (see Section 4.4.5.6), this does

provide a useful indication that social capital, in the sense of "*the norms and networks that enable people to act* ***collectively***" (Woolcock & Narayan, 2000: p.226), whilst not ubiquitous, is present in all three communities. The second project objective has, therefore, been achieved.

6.6 Key Findings: A Foundation for 'Deeper' Analysis?

This chapter has reported the initial phase of the survey-data analysis. As a result of this, two project objectives have been achieved. Firstly, using quantitative methods, it has been possible to show that a percentage of the population in each town can be regarded as 'vulnerable' to flooding. Secondly, it has been shown that there appear to be social networks and norms of reciprocity and trust operating within the populations that have the potential to enable collective action. However, neither of these findings has been straightforward.

In relation to vulnerability, it has been revealed that the populations of Mablethorpe and Cleveleys are most widely affected by factors that make them particularly vulnerable to the flood hazard itself (i.e. the percentage of individuals over 74 years of age and those suffering limiting illnesses: e.g. Ramsbottom *et al.*, 2005). In Morecambe a smaller, though still significant, percentage of the population is affected in this way. However, indicators suggest that here, a greater number of households could suffer long-term effects, purely on the basis of their apparent financial-deprivation status, than in the other towns. This is not to belittle the impacts that financial deprivation might compound on those in households already affected by chronic illness or old age in this and the other towns. It simply serves to highlight the differences between the three communities.

In relation to social capital, it has been found that all three communities are characterised by similar norms of trust and reciprocity (two core elements of the concept). Individuals in each community also undertake a range of social networking activities. In each of the three towns the predominant activity undertaken, by percentage of those involved and by number of tasks performed by each individual, is voluntary social support. Civic engagement and social activity in formal groups are performed by a much smaller percentage of all the populations. This would seem to indicate that there is a tendency toward bridging social capital and evidence that the communities' structures are more individualistic (i.e. low reported formal social activity) and more lateral than hierarchical (i.e. more socially supportive activity than civic engagement).

In accordance with critical-realist philosophy and Clarke's (2001) encouragement to use a mixed-methods approach in policy-orientated research (see Sections 1.2 and 4.2), the analysis undertaken in this chapter has taken the form of an initial investigation of quantitative data. This has provided a breadth of understanding in relation to the concepts of vulnerability and social capital, by making them 'visible' within the sample population. According to Sayer (1992) and Clarke (*ibid.*), what is now required is for the analysis to refocus, toward investigating the concepts in depth. Accordingly, Chapters 7 and 8 will now supplement the quantitative analysis, through the use of more intensive and qualitative methods. In effect the findings reported in this chapter will be used as a framework, or 'skeleton', upon which to hang the analyses that follow (Bryman, 2006). Using this approach it will be possible to reveal, more clearly, the social contexts within which the respondents operate and how these contexts may influence, or be influenced, by the vulnerabilities and social effects and phenomena that have been discussed in this chapter.

7 Risk Perceptions: Flood Hazards and Protective Behaviour

7.1 Introduction

In the previous chapter an investigation was conducted in order to quantify the samples' flood vulnerability. Through the analysis of survey responses it was found that over 50% of the population in each town could be considered as being significantly vulnerable to flooding. Further analysis also revealed that the social networking in which the population reported participating, exhibited predominantly bonded or lateral connectivity, with only a minority displaying the characteristics of hierarchical linkage. These findings have provided an indication of community structure, which can now be supplemented by the analysis of risk perception, preparedness and community resilience. The investigation of these issues will be conducted in this chapter by way of addressing both of the project's second objectives:

> **Objective 2a:** To ascertain and describe the range of individuals' perceptions of, and responses to, coastal flood risk
>
> **Objective 2b:** To identify the range of influences which have stimulated, shaped and developed these perceptions and responses

In order to achieve these objectives, the Chapter is divided into four analysis sections. Initially, Section 7.2 will assess the respondents' prioritisation of flooding, relative to an assemblage of other environmental concerns. This allows for an understanding of how flood hazards are locally contextualised, both by individuals and more generally by the town samples. Section 7.3 will then investigate the sources from which the population obtain their flood-risk information. Particular attention will be paid to evidence that might indicate that information from particular formal or informal sources is regarded preferentially to that from others. Respondents' experience of flooding, and their knowledge of environmental flood cues will also be assessed, as these too can directly

influence an individual's perception of risk. Section 7.4 will gauge the respondents' perceptions of how likely they consider the flooding of their home to be. How these perceptions are influenced by the personal assessment of such external factors as climate change will also be analysed. Finally, Section 7.5 will investigate the respondents' hazard preparedness. Starting with their knowledge of local flood warning systems, the analysis will then investigate the actions individuals believe they would take upon warning receipt. The chapter will then be summarised. Whereas this chapter relates principally to issues of awareness of and potential responses to contemporary flood hazards, Chapter 8 will project forward to investigate resilience-building against future events.

7.2 Flood risk as a local priority

Buckle (2003) points out that hazards exist as only one strand in the tangle of stresses and strains that make up individuals' daily lives. Taking this into consideration, the first survey item was designed to quantify how the respondents regarded the issue of flooding, relative to a number of other environmental issues affecting their lived environment. In order to do this the respondents were asked to apply a first, second and third rank to three of eleven issues. Table 7.1 shows the combined results for all towns.

Looking at the combined result, it is apparent that flooding could be considered the most important environmental issue, as it was ranked highest by over 20% of the population. Youth crime registered a close second with 17.5% and traffic congestion third with 14%. However, by totalling the 'top three' environmental issues (final column Table 7.1), it can be seen that youth crime is actually considered the most pervasive problem, followed by dog mess and traffic congestion. Flooding attains only fourth place.

Environmental issue	Most important %	2nd Most important %	3rd Most important %	Cumulative % of 1st 2nd and 3rd
Air Quality	4.08	2.04	4.66	10.79
Countryside Loss	3.79	3.21	2.92	9.91
Traffic	14.29	14.87	8.16	**37.32**
Litter	5.25	12.83	12.54	30.61
Noise	0.87	0.58	3.50	4.96
Water Pollution	2.92	4.66	2.92	10.50
Housing Quality	6.12	4.08	7.29	17.49
Recycling	3.21	4.66	7.29	15.16
Dog mess	8.16	13.12	16.03	**37.32**
Youth Crime	17.49	16.62	13.41	**47.52**
Flooding	**20.12**	10.50	6.12	**36.73**

Table 7.1: Survey Question 1: "What are for you the three most important local environmental issues in [your town] at the moment?" (*n* = 305)

Examining this data in aggregation, however, camouflages a very important difference between the individual towns in relation to flooding in particular. When the responses are divided by town (Table 7.2), it can be seen that, whilst the issue of flooding is regarded as being **the** 'top three' issue in Mablethorpe (49%), in Cleveleys the issue attracted the third highest number of votes (42%) and in Morecambe only the sixth highest number (15%). In Morecambe 'youth crime' attracted the highest response (54%) with litter second (47%). Why flooding is considered so differently, particularly in Morecambe, is not straightforward, but could be because people in this town do not regard the sea as being something that could impinge on their day-to-day living, in the same way as might the residents of the other towns.

Town / **Position**	Mablethorpe	Cleveleys	Morecambe
	Issue and cumulative percentage of votes cast		
Highest voting	**Flooding 49**	Traffic 45	Youth Crime 54
Second highest voting	Youth Crime 45	Youth Crime 44	Litter 47
Third highest voting	Dog mess 34	**Flooding 42**	Traffic 42

Table 7.2: Environmental issue prioritisation in three towns, by accumulation of votes cast across all 'importance' categories
NB. Flooding attracted the sixth highest vote (15%) in Morecambe

In support of this suggestion, Fordham (1998) described research carried out near the River Thames, which revealed the importance of proximity to the water as being a factor that affected perceptions of flood risk. Fordham also pointed out the importance of other variables that can have a bearing on someone's perception of flood risk in their environment:

> "There is, of course, great spatial and experiential differentiation (between those flooded and those not; those who live close to the river and those who do not; those who have chosen to live by a river and those who have not; those who live in scenic river environments and those who live in degraded river environments; those for whom the river represents beauty and asset, and those for whom it represents risk and threat) that can create major divisions in communities." (Fordham, 1998: p.28)

Although Fordham's research was carried out in relation to a river frontage it could be suggested that similar factors also play a role in the formulation of perceptions within coastal populations. Both the Mablethorpe and the Cleveleys samples contain high percentages of retired people, in comparison to the levels of the employed in Morecambe (Section 6.2.6), and both these towns could also be argued to have a more explicitly 'seaside resort' or 'retirement town' focus than does the modern Morecambe.

Morecambe is a town that is regarded as developing more as a base for long distance commuters, than as a holiday destination (ODPM, 2006). There is, therefore, a suggestion that Morecambe can be regarded as being more peripheral to main areas of coastal tourist activity (Agarwal, 2005). This is something that was revealed during discussions, wherein the perception that the town is currently used as little more than a dormitory by tour operators was described with frustration:

> MrM2_04: "But [the coach operator] bought The Strathmore [Hotel] because … they wanted somewhere that was also central because they were filling [their other hotel] and thought, "Right that's central, they can get to Lakes, they can get to Yorkshire, it's sort of central to everywhere". So what they're doing is busing them in and busing them out. They're staying all through the night over the week, but they're not doing anything in Morecambe, you know."

Agarwal and Brunt (2006) suggest that factors such as these are important to acknowledge, because they can mean that applying a 'one size fits all' analysis, to even apparently similar 'post-mature' coastal communities, can be inappropriate.

In corroboration of Agarwal and Brunt's suggestion, it has here been shown that flooding is regarded slightly differently in each the three towns surveyed; one size does not fit all. Acknowledging that the populations are different in this way, prior to taking the analysis any further, allows for the investigation of whether other aspects of risk perception can be equally differentiated.

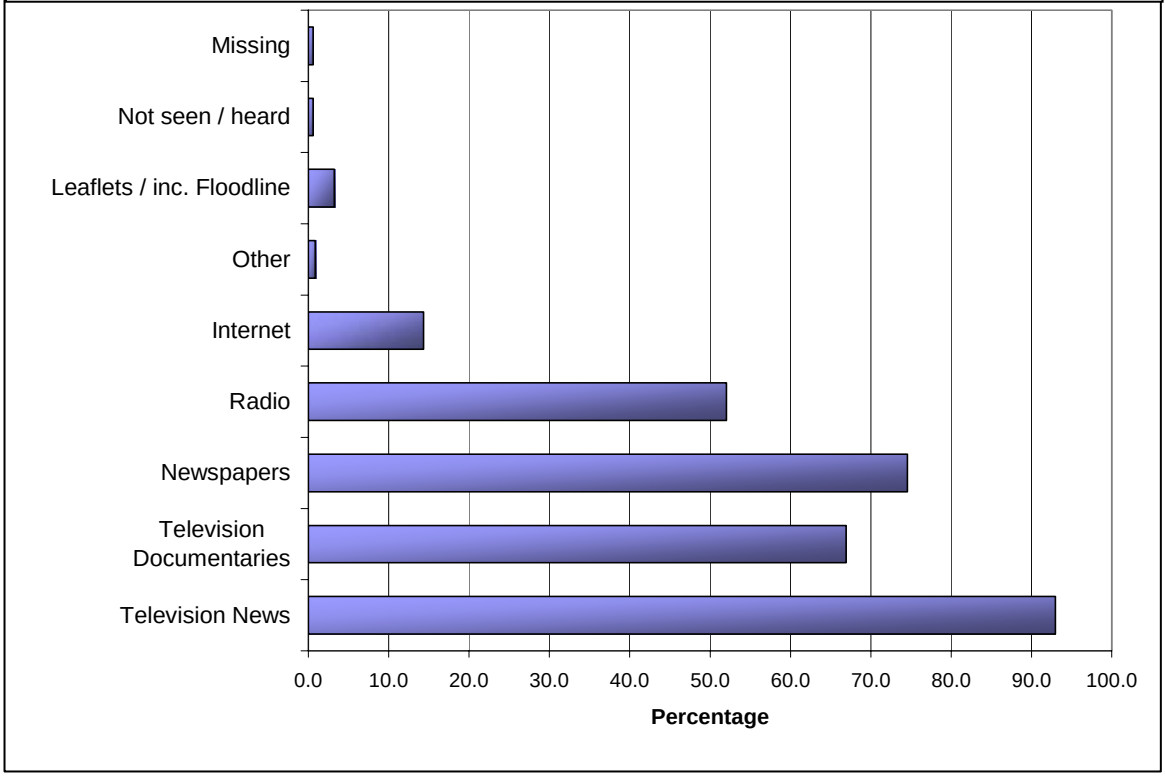
7.3 Sources of evidence

In this section the sources of evidence that the respondents report using to construct their risk perceptions will be investigated.

7.3.1 The Media

In the 12 months prior to the survey, the reportage of flooding and flood-related issues was seen or heard through different media formats by an overwhelming 99% of the respondents (Figure 7.1). There was no relationship between age or gender and media type, so, in effect, the varied coverage was seen by an undifferentiated mix of individuals across the full range of media (Table 7.3).

Figure 7.1: Media: Sources of flood information



	Single source	2 or 3 sources	4 + sources	Floodline + media sources	Total	Not seen / Missing
%	12	46	38	3	99 (*n* = 341)	1

Table 7.3: The media sources where respondents have seen / heard flooding mentioned

The traditional media formats were most often cited, with only 14% indicating they had seen the issue reported on the internet. This low reporting of the internet's awareness-raising effect (in a nation where 63% of the population has access to it: ONS, 2008), suggests that there is still some way to go before internet IT will be seen as taking over from the more traditional media formats (Spence *et al.*, 2007): notwithstanding, that for many of those who **do** have access, the internet is becoming an increasingly important information source (Norris, 2001). This finding is in accord with that of earlier coastal flood research (Kaiser *et al.*, 2004), and research carried out for the Environment Agency in relation, specifically, to flood warning technologies:

> "The new and emerging technologies offer significant benefits to the operator, from better speed of dissemination to improved cost effectiveness, yet take up of new warning technologies is poor and international surveys confirm UK experience that warning recipients prefer the tried and tested traditional methods." (Tapsell *et al.*, 2005: p.60)

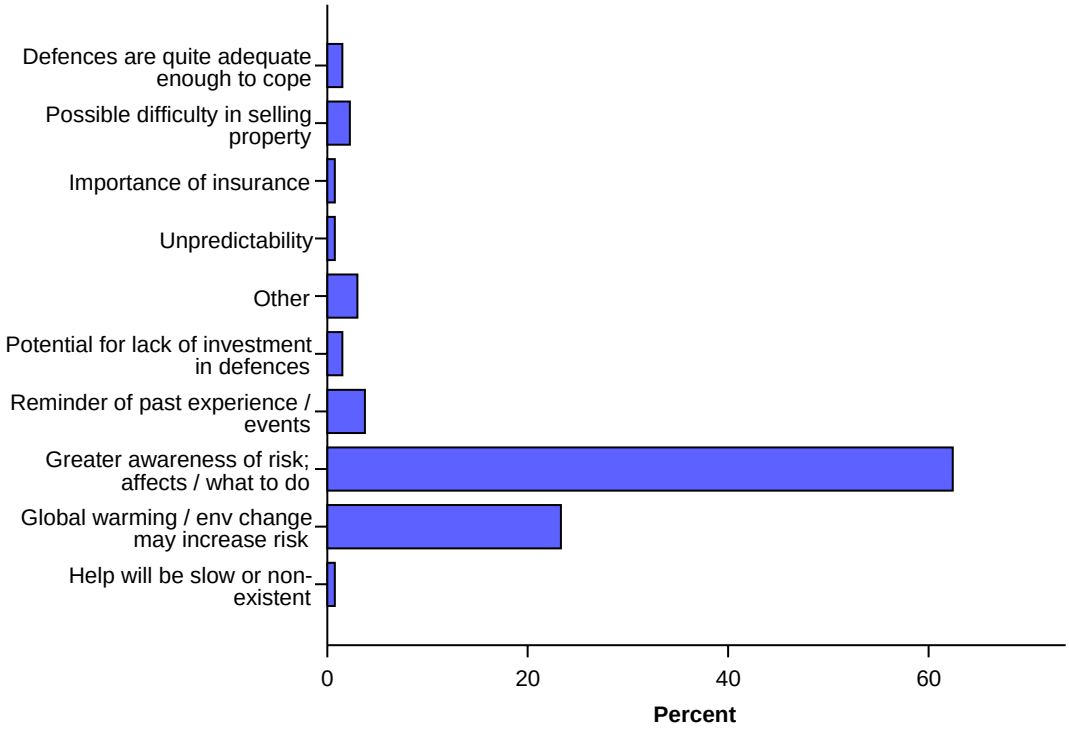
The question did not offer Environment Agency or local Emergency Planning Department sourced literature as an alternative. However, 3.2% of respondents did report that they remembered learning of flood-related issues directly as a result of leaflets delivered by these authorities, or by direct contact with the Environment Agency's '*Floodline*' advice service (E.A., 2007). These letters and leaflets, which form part of the Environment Agency's formal flood warning service, will be discussed in detail in Section 7.5.1.

One explanation for the low reporting of formal awareness-raising literature is likely to be that such information is circulated in these towns through other media formats. Accordingly, such information could be missed, ignored or misinterpreted as coming from that particular media organisation (e.g. from the BBC), rather than from more formal FRM organisations.

7.3.1.1 The media effect in flood risk understandings

The next item asked how respondents thought this flood-related information had shaped their risk perceptions. The item (Q.2b) was designed in order to encourage the respondent to personalise whether or not local, national or international media coverage of flood issues had led them to change their understanding of how they, personally, could be affected by such a hazard. In all, 45% felt that this information had influenced their personal risk perceptions in the preceding 12 months. When asked to explain how their understanding had changed, 86% of these respondents gave a reason (Figure 7.2).

Figure 7.2: Coded responses to question: "How has your understanding of how flooding might affect **you** been influenced by media coverage?" (*n* = 133)



The main media influence reported was one of awareness-raising. Particularly, the risk of damage to property was regularly mentioned:

Surv_MbF-118: “After watching news of people's homes being flooded, until you see it first-hand you don't really realise how bad it really is”

Positively, from an FRM perspective, other responses in this category indicated the media’s usefulness in suggesting preparedness and response strategies, including the importance of having insurance:

Surv_ClF-35: “[I’ve been] made aware of the need to have the necessary phone numbers of the new tidal warning service now in operation on the Lancashire coast and have registered with 'Floodline' Warnings Direct at Environment Agency. Being aware of the codes re: level of flooding expected”

Another theme related to peoples’ understandings of the issue of future sea-level rise, and climate and environmental change. These were cited by 23% to indicate concern over the future sustainability of homes and coastal zones more generally:

Surv_MrF110: “Programmes showing coastline erosion resulting in flooding made me realise we could be susceptible in the future”

Only two people (1.5%) indicated that the media coverage of the issue had affected their perceptions in a way that assuaged rather than increased their concerns:

Surv_MbM-112: "Not at all [worried; the] flood defences are more than adequate for our lifetime”

The role of the media was also taken forward in the focus groups, during which it was clearly recognised to have a role in raising community awareness. The print media in particular was, however, criticised, in that the sheer volume of unsolicited advertising and information that comes with today’s newspapers results in people ‘junking’ any content which does not directly interest them. Television was recognised as a useful media for the communication of flood-related information. However, the fact that television is limited in its ability to deliver localised information was acknowledged. Conversely, the

use of local radio was identified as providing many people with good quality information which was locally relevant (see also Section 7.5.1.3):

ClM1_01: “One thing … that would probably help me more than a local newspaper which I don’t tend to subscribe to, would be the local radio stations, which I do listen to on a regular basis

ClM1_02: Yeah, that would be a good idea, yeah, that would be a good idea because loads of people tune into it don’t they?

ClM1_01: Well, I always listen to a station called Radio Wave which is quite a good station for local news basically /

ClM1_02: / Radio Wave, yeah I do /

ClM1_01: / and that’s where I glean most of my local news from, not from a newspaper because as I say I chose not to subscribe to that, or TV advertising maybe but I still think a far better way of reaching a more local area would be the local radio stations.”

7.3.2 Social networks

The survey then investigated the role that two types of social network play in enabling respondents’ to construct their flood-risk perceptions; the formal and the informal.

7.3.2.1 Formal discussions

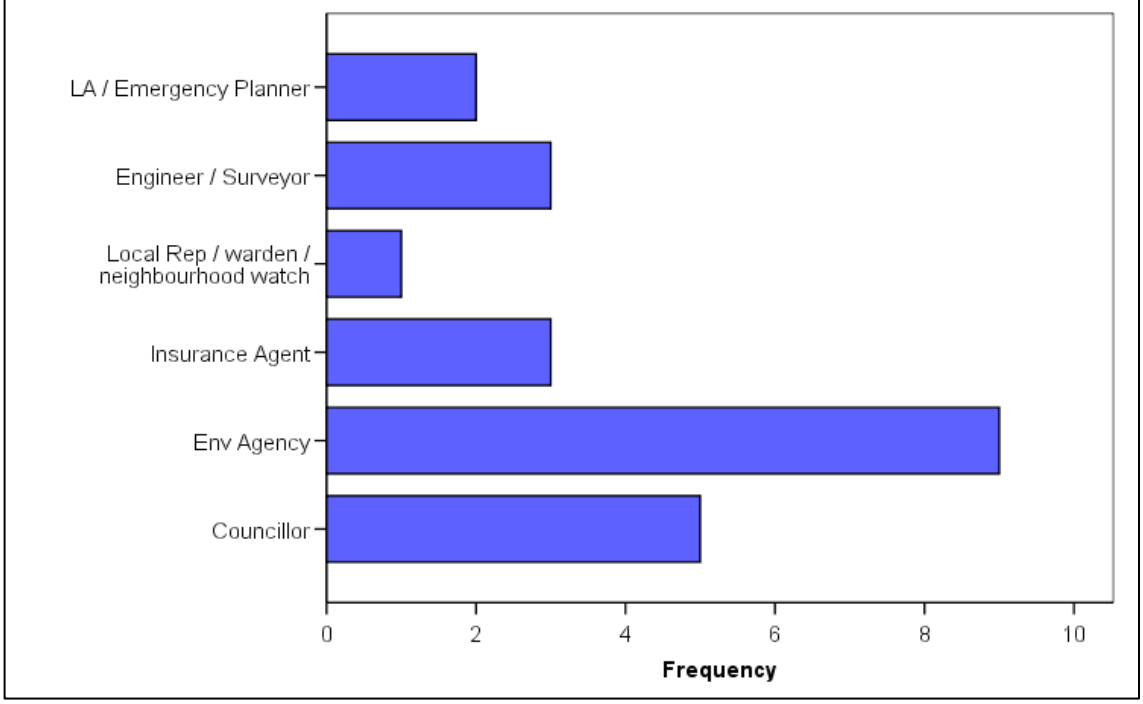
As could be predicted from Wynne (1992), the fact that there is knowledge of hazard exposure within the population, has not resulted in many people seeking ‘expert’ risk evaluations to complement their own assessments. Only 6.6% indicated that they had spoken formally about flood risk with any sort of ‘official’ (Figure 7.3). From these respondents, the Environment Agency registered the greatest number of contacts (9), whilst five people reported communications with a local political representative. Only six people reported having spoken to either insurance agents or surveyors/engineers. Considering that exposure to coastal flood risk is something that insurance companies are becoming increasingly concerned about, this is perhaps a little surprising (ABI,

2006). In the survey and the focus-group discussions, a range of concerns over the insurance industry's attitude to flood premiums on domestic policies were revealed:

> MrM2_04: "Yeah, I rung up because … I'm a cheapskate I rung up to get the cheapest quote right and one of the questions they ask is "Are you in a flood risk area?" and I said "Last time it flooded was in 1983 -84" and they said "Right, okay" and they never increased my premium, but I have told them, which is one of the main things that alight if we did get flooded and they said well you never told us you know, it invalidates it doesn't it, but I have told them."

This particular statement was made by a respondent who had indicated that he had **not** spoken formally about flooding. This suggests that 'formal' discussion in this context could be perceived, by some, as something only undertaken when the issue is regarded as a personal concern, rather than when it is invoked as such by a third party (in this case by the insurance agent).

Figure 7.3: Formal informants.
NB. Only 6.6% of the population responded positively to this item (*n* = 23)



One point to note, in relation to the formal discussions reported with the Environment Agency, is that whilst it is possible that all these reported contacts could have been made by people wishing to **increase** their flood preparedness, there is also another possibility. As only 25% of all respondents actually expect that they would receive a flood warning from the Agency (Section 7.5.1), there could be another reason for such contact. It is possible that they were made out of frustration, in relation to what people see as the Environment Agency's role in attracting an inappropriate loading of flood-premiums onto their home insurance policies. It is also possible that they were objecting to being informed by the Agency that they do live in a delineated flood hazard area. This suggestion is supported by a quote from Agency staff member:

> Key_Mr02: "I have to say that it's probably because the insurance company won't give them insurance unless they're on our system or oftentimes I get people phoning me up to say I want to go on your system because my insurance company say I have to and then I look and I see well actually you're not eligible for a direct warning at this time … I've had other people who've been really angry that they're in a flood warning area and other people who've been disgusted with our mailings."

Such a supposition is partially supported by the fact that three of the nine people who reported contact with the Agency later indicated that they thought the flooding of their home to be unlikely.

Although a volunteer flood-warden system does operate in Mablethorpe, no respondent recalled having spoken to such a person in this town. In fact, only one person, in Morecambe, recalls speaking to a community volunteer regarding the issue of flooding. It is possible, however, that these wardens may be considered, for the purpose of this survey, as friends or neighbours rather than as 'officials'. In this case, contact with them would have been registered as informal communication.

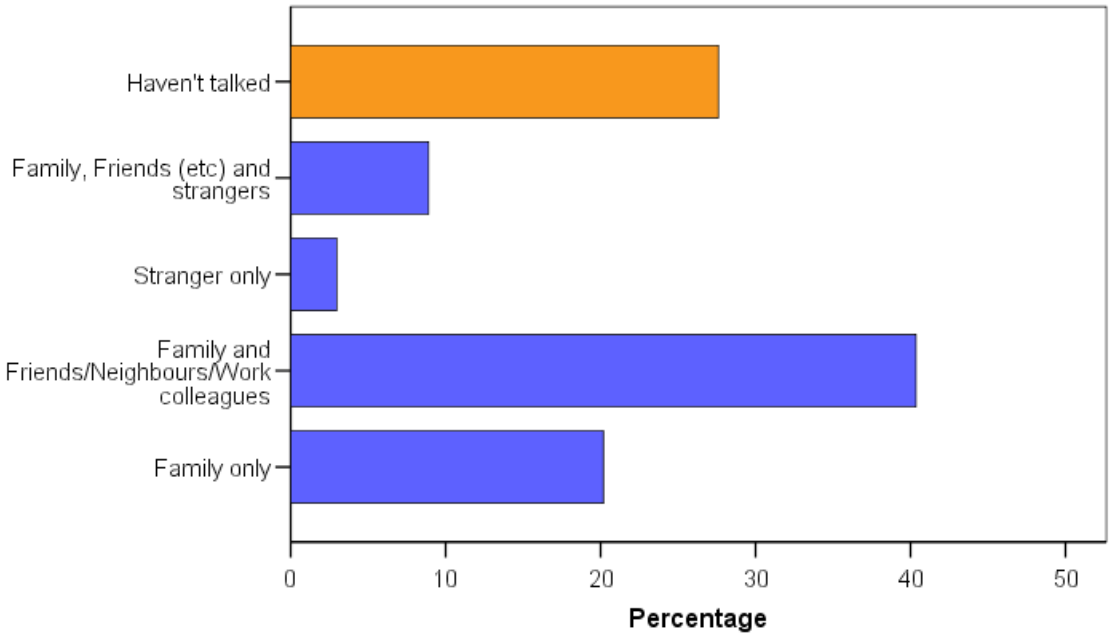
Overall, this analysis shows that very few people in the communities appear to have been motivated or incentivised to formally seek flood-related information, in addition to that which is inhered within their personal local-knowledge, or which had been made available to them through the media. However, a cross-tabulation was performed between those individuals who have discussed the issue formally and those individuals who reported they had been involved in some form of civic engagement (Section 6.4.3). This test revealed that there is a relationship between these two variables ($p < 0.05$). This could simply mean that the civic-engagement activity that was reported in the towns was mostly related to flooding issues, with such an explanation bringing an element of circularity into the hunt for a social-capital focused explanation of resilience in this population (Sobel, 2002). However, it could also mean that there is a greater likelihood that it is those individuals who are prepared to instantiate hierarchical linkages (in order to resolve diverse local issues), who have also shown themselves to be more open than others to using linkage as a means to inform their understanding of their own and / or their community's hazard exposure. In relation to the other distal indicators of social capital (Section 6.4.3.2), there was no relationship between formal talking and either the social support or the social activity related networks data.

7.3.2.2 Informal discussions

Figure 7.4 illustrates the informal discussions and communications about localised flooding issues, in total 72.4% reported discussing the issue in this way. Whilst 20% reported speaking to family members, 10% spoke only to their partner, with the remainder reporting discussions with other family members including parents, children and extended family. Such discussions, solely amongst family members, describe communication occurring within bonded social networks (Section 3.2). Additionally, conversations that involved family members, but also bridged out of these close-knit

networks to include friends, neighbours, work colleagues and strangers, accounted for 53% of the informal discussions. In all, only 28% of respondents indicated that they had not spoken about local flooding issues informally in the preceding year.

Figure 7.4: Informal talk grouped by bonded or bridged network type

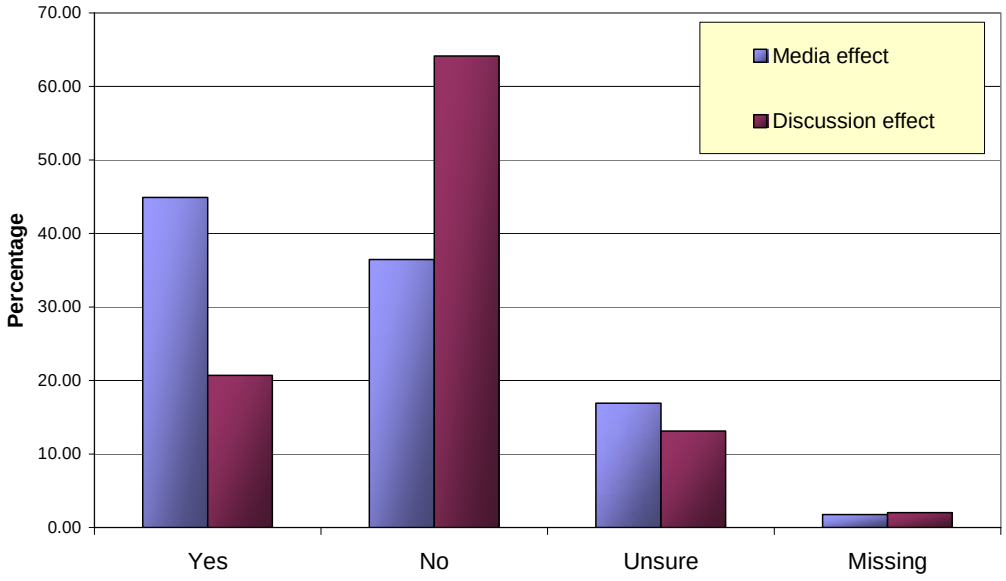


Discussions within informal social networks about local flooding issues do, therefore, appear to be widespread. However, the influence these informal discussions have, in changing respondents' perceptions of their personal flood risk, appears to be less than that reported in relation to the effects of media-based coverage (Figure 7.5). One of the themes that emerged during the group discussions was that it was actually the media coverage of sometimes distant flood events that actually served to trigger respondents' discussions about local hazards:

> MrM1_01: "Yes, … it's not something, it's only ever talked about when, like now [after the summer floods] for instance when something has happened somewhere else. That's when you tend to, people sort of

> relate it to closer to home but in normality it's not really ever discussed, either at work, and I work at a plumbers merchants and, you know, you get all sorts of topics of conversation across the counter, but it's only when, … they've all seen it on the news and what have ya [*sic*] people are talking about it, but not in normality though."

Figure 7.5: Perception changing effects of media and discussion



It is likely, therefore, because of this strong media / discussion interrelationship that only 20% of respondents reported that their opinions had been **changed** during formal and informal discussions, compared to the 45% who reported a media effect (with no significant variation across age or gender divisions). This comparison is interesting, because media coverage is less likely to have been situated within the respondent's local area, whereas face-to-face discussions about 'local flooding issues' could be seen as being completely grounded in the local context. Uzzell (2000), suggests that an inverse-distance effect can operate in relation to particular environmental problems. This effect dictates that people's perceptions of problems, such as global warming, become

more acute the farther away they are from the perceiver. This in turn leads to feelings of powerlessness to tackle such issues; a condition Uzzell calls 'environmental hyperopia'. The findings in this project would suggest, however, that an opposite effect may be operating within these coastal populations. In these samples, the media coverage of the impacts of flooding, on other people in distant places, seems to be having the effect of catalysing higher awareness of local hazard exposure. This does not mean, however, that these individuals necessarily feel motivated or able to make themselves more prepared. In this context, evidence of fatalism, in relation to flood knowledge and perceptions of risk, could signify a localisation of Uzzell's environmental hyperopia. Such fatalism was made evident in many survey responses and in comments made during all the focus group discussions:

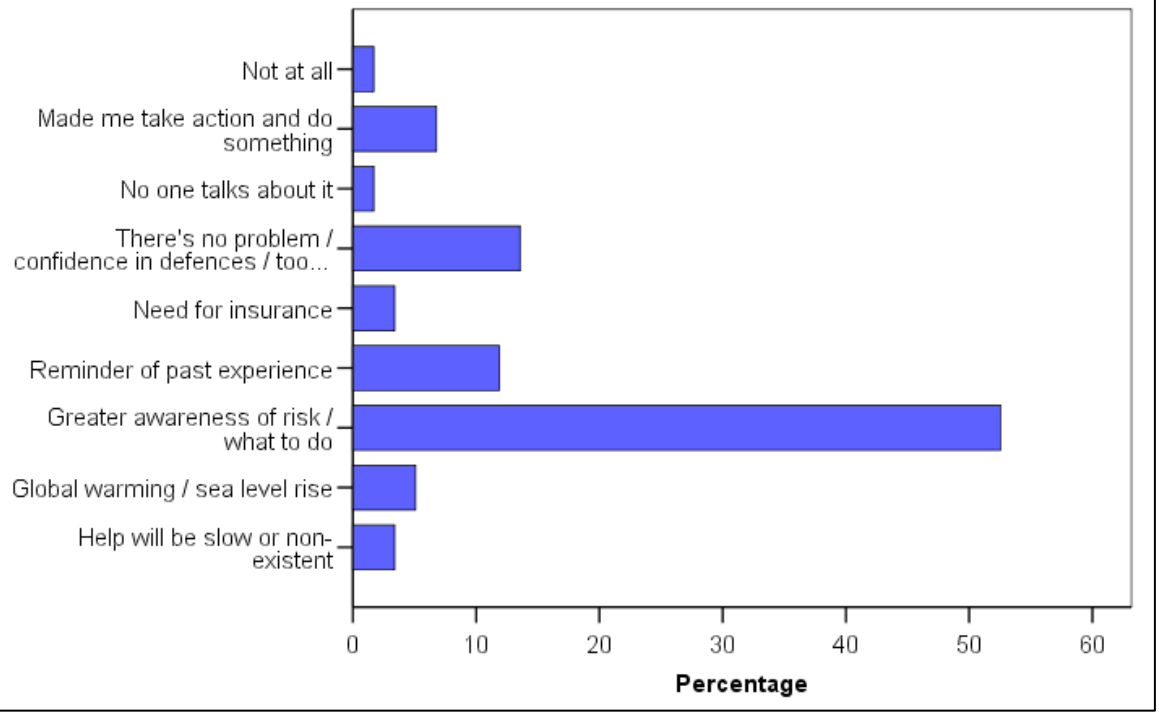
> MrM2_04: "I think we're all in an area that if it floods it floods and there's nothing we can do about it.
>
> MrF2_01: Water'll get in wherever it needs to get in won't it
>
> MrM2_02: If you choose to live by the seaside and you choose to live in a house where the sea used to be, then one day it might happen. You're hoping it won't happen but you know it could happen"

Another consideration in looking at the data from this perspective is that the survey question only asked if discussions had led to opinions being changed during the twelve month period preceding the survey. This is because twelve months is a timescale which is not too likely to overtax a person's memory of events (Oppenheim, 2004). However, this time period would not have included discussions or reportage in the direct aftermath of flooding events in the UK, for example; Boscastle (August 2004) or Carlisle (January 2005), or in the US, e.g. Hurricane Katrina (August 2006). It is possible, therefore, that the perceptions of a greater number of respondents might also have been formed or reified by these relatively recent, yet geographically distant, major events, without any

need for subsequent adjustment in the more quiescent period which was considered in the survey[1].

The effects that discussions reportedly had on perceptions, although affecting a smaller number of people, do show one similar theme to the effects of media coverage (Figure 7.6).

Figure 7.6: “How has your understanding of how local flooding might affect you been influenced by talking about the issue?” (*n* = 59)



As with the media, the greatest influence that conversation had on flood-risk perceptions was the raising of general risk awareness and increasing knowledge of what actions could be taken in the event of a flood (52.5%). Global warming and sea level rise were again mentioned, but by only 3 respondents, as opposed to the 31 who cited a perceived

[1] *NB.* The survey was delivered before the 2007 summer floods, the discussions occurred after them.

media effect regarding this issue; an indication that global climate change is still considered by the majority to be somewhat secondary to local risk factors (Lorenzoni, 2006). For some, discussions also had an ameliorating effect in relation to local risk perceptions, i.e. 14% indicated that discussing the issue had reduced their concerns. This was reported as being the result of the reassurance of others that, for example; '*it is not a problem*', that '*the defences are quite sufficient'*, or that '*a flood will not occur until long into the future'*.

During the focus groups the participants discussed whether local flooding was ever brought up as a topic of conversation between neighbours. All of the groups reported that such conversations only really took place when chronic flood issues were prevalent in a particular area. Although there was evidence of groundwater and pluvial flooding in each town, whether people spoke about it seemed to depend on whether either of these hazards presented a tangible threat to the participants themselves. For example:

Interviewer: Do you talk about [flooding] within your streets?

MbM1_01: "Yeah, certainly do /

MbF1_05: Always.

MbM1_06: It is a topic of conversation yes.

MbM1_01: / especially when I'm pumping out the road

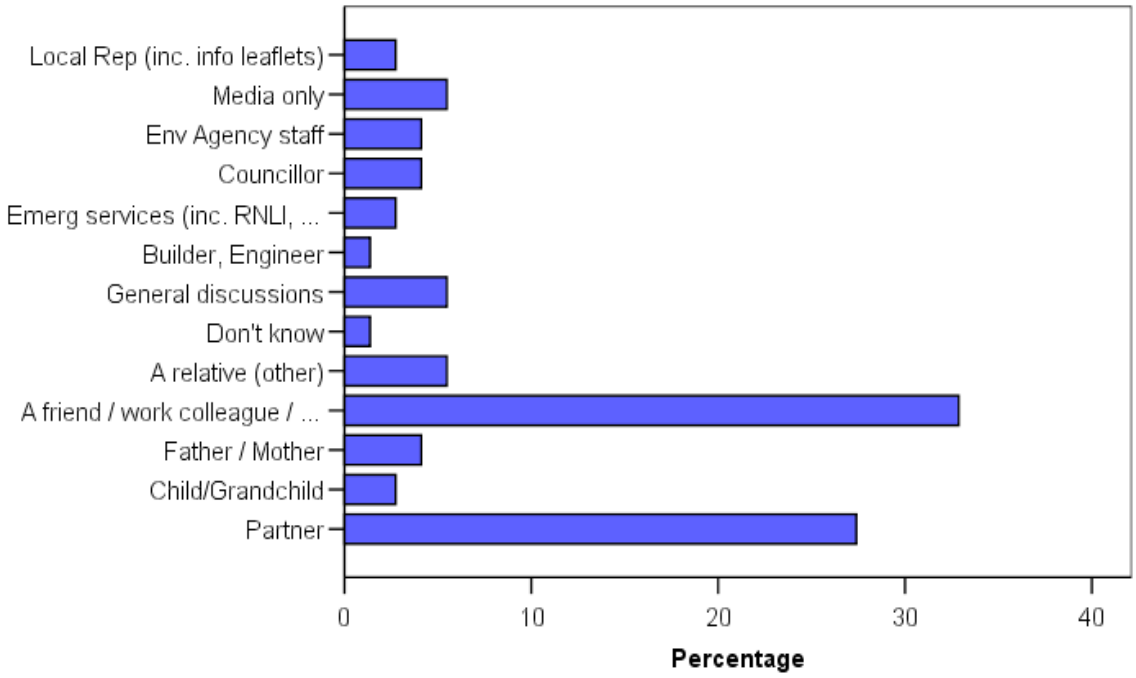
MbM1_06: Yeah"

However, not everyone agreed that flooding was a normal topic of conversation at all. In fact, some were surprised that chronic flood problems actually existed in their town. Therefore, it appeared that, if groundwater or rainfall flooding had not been experienced, then discussion of these types, or other types of local hazard, was unlikely to occur.

7.3.2.3 Influential information sources

Having reported with whom they had discussed local flooding issues, the survey respondents were then asked to categorise the person whose opinions on the subject had influenced them most (Figure 7.7).

Figure 7.7: Most influential source for local flood risk information (*n* = 73)



Although the item only achieved a relatively low response rate (*n* = 73), two clearly influential information sources were revealed; 'partner' (27%) and 'friends, work colleagues, neighbours' (33%). From a social capital perspective these two sources of information are representative of bonded and bridged network links, respectively (Section 3.2). It is not, however, possible to assess whether these individuals were particularly well-regarded because they espoused increasing risk levels, decreasing risk levels, or the persistence of the respondent's perceived *status quo*. Without more

substantive evidence to the contrary, the preponderance toward a preference for informal contacts' opinions, could be suggested to imply that respondents tend to err toward managing their perceptions through a confirmation bias (Section 2.1.3.1). Put simply, this means that people preferentially trust the opinion of those who are most likely to agree with them (Nickerson, 1998). That some individuals choose not to seek out 'expert' opinions, or in fact, any opinion at all about local risk levels, could also, however, be a straightforward indication that these individuals do not perceive that their personal appraisal of potential threats is sufficiently in deficit to warrant such an action (Grothmann & Reusswig, 2006).

It has been important for this project to identify that informal contacts are regarded by many people as being the most influential sources of flood-risk information; this aligns with the literature (Perry & Nelson, 1991; Wynne, 1992). However, there is a need for further research to clarify whether this preference is based purely on a confirmation bias, or whether these informal contacts have introduced genuinely new perspectives, through which the respondents have been made to reassess the basis of their knowledge.

7.3.3 Other sources

In addition to the media, and discussions within networks, other important aids in the construction of risk perception are an individual's direct experience of hazards, and their personal understandings of the environmental cues that can signify their imminence (Gruntfest & Ripps, 2000; Slovic *et al.*, 2001).

7.3.3.1 Experience

Table 7.4 shows the responses to the flood experience item. The sample is split roughly 70 / 30 in favour of those who have not experienced flooding, know no one else who has, or who are unsure whether they have or have not[2].

Flood experience	Responses	Yes		No		Unsure	
		f	%	*f*	%	*f*	%
All Towns	339	104	30	229	68	6	2

Table 7.4: "Have you or any of your close family or friends ever experienced a flood that caused damage to your / their property?"

It has been suggested that the *availability* heuristic is used by individuals in order to construct risk perceptions. This means that people tend to equate their perception of how big a flood might be in the future, with the magnitude of those of which they have direct and most recent experience (Section 2.1.3.1). The question did not, however, ask whether the respondent had experienced the flooding at their current address, nor did it question the scale of any remembered event's consequences. Therefore, hidden within the 30% of the sample who have experienced a flood, or who know someone who has experienced a flood, will be a range of memories, which will each provide its own degree of influence over how concerned that individual might be about their exposure and vulnerability.

In cross tabulation, relationships were found between flood experience and both the respondents' perceptions of flood likelihood ($p = < 0.05$) and their knowledge of damage limiting actions (χ^*). In effect, people with flood experience in this sample do appear to

[2] As the availability heuristic is predicated upon recall, the respondents who indicated that they were 'unsure' can be added to those with no experience. This is because for an event to affect one's risk perception through availability it must *ipso facto* be memorable.

believe that flooding is more likely to occur than do those without it. They are also able to suggest more actions that they could personally take upon hearing a flood warning, in order to reduce the impacts and consequences of flooding on their households. These two findings indicate corroboration of past research that suggests that flood experience does influence risk perceptions and resilience within a population (Burningham *et al.*, 2008; Siegrist & Gutscher, 2006; Slovic *et al.*, 2001; Thrush *et al.*, 2005).

Floods can, however, be experienced in very different ways. Analysis of the focus group discussions revealed that the participants had experienced a broad range of flood hazard types and intensities. For example, there were participants who "*vividly*" remembered the more extreme sea floods that had occurred in their town's histories:

> MrF1_03: "When we first moved here… in 1988 … somebody knocked on the door on a very windy day and they said to me "Prepare to repel flood water!" I swear to you those were the exact words "Prepare to repel flood water!" and I was a little bit gob-smacked, and I said "Oh, is there a flood expected then?" and he said "Oh yes, there's a spring tide and an on-shore wind and we expect that the sea will come over."

However, whilst some individuals did remember the extreme sea flooding events, and the local folklore surrounding them, as a modern-day hazard, sea flooding tended to be regarded as having a very low probability of reoccurrence. Knowledge of these past events was being, effectively, tempered by an appreciation of the considerable work that had been carried out on sea defences in all three towns since these inundations:

> MbM2_03: "Well, actually if the conditions of '53 repeated themselves we wouldn't flood /
>
> MbM2_02: / No /
>
> MbM2_03: / because the defences are that much higher. We've had higher tides since '53 and we've never flooded /
>
> MbM2_05: / That's right /

MbM2_03: / basically, because the defences are higher."

Whilst there is an element of truth in this group's discussion – in that there have not been any severe, defence breaching, floods since that particular event – this discourse could also be regarded as an example of the belief that structural defences can protect against all eventualities. According to Muir-Wood (2005), the discussant 'MbM2_03' may indeed be correct in suggesting that a repeat of 1953 storm conditions would not cause the flooding of Mablethorpe. However, Muir-Wood considers such an event to have only a 2.5% AEP. Accordingly, there is always the possibility of a storm surge of lower probability occurring (ABI, 2006).

In contrast to the relatively low expectation of coastal inundation, the issues surrounding experience of chronic groundwater and rainfall flooding illuminated a spectrum of emotions. For example, for several individuals this type of flooding was considered as nothing more than a nuisance:

MrM1_01: "So it's sort of something, … even me dad's back garden, when it rains it floods but, it's a nuisance for him for a day or two but that's as bad as it gets so you just go with it, you know."

However, for others, the prevalence of these hazards led to anything from a degree of fatalism about local conditions, to extreme concern, or even animosity toward those deemed as being ultimately responsible for persistent problems:

MrF2_03: "When we get a real downpour, we've got like a concrete [wall] and then we've got like a ditch with soil … we've put stones there now but it still comes over the stones and goes towards the kennels and every year I've noticed that it's getting closer and closer towards the house and … it's still creeping up and around and I've noticed that, this year when it did flood that it came more towards the back door than it ever has done, … yeah, it's something I worry about"

Or,

MbF1_05: "Obviously living together we kind of discuss it, especially when you're wading down your garden nearly up to your knees, you know. And you watch your neighbours across the road in tears, time after time and this is with, not flooding, with the real flood as we had [in 1953], just as you get now it's just [caused by] normal rain."

And,

MbM1_04: "Unfortunately, our experience with flooding in our area, or drain back-up, led us to a conclusion that something was very wrong with the way it had all been wired up and synchronised and that that was a truth."

If risk perceptions are partially born out of experience and the availability of benchmark memories, then this research suggests that the perceptions of individuals residing in low probability flood zones should not be regarded as being equal. There are broad understandings that extreme flood events have occurred in the past. However, different perceptions of vulnerability and exposure have been developed, as a result of individual experience, at a variety of scales. According to the literature, such a variety of experience would inevitably lead to a spectrum of responses being employed in the event of an extreme flood; from effective physical measures, through simple optimism, to straightforward incredulity (Johnston *et al.*, 1999; Slovic, 2001; Spittal *et al.*, 2005).

7.3.3.2 Environmental cues

As well as experience, there was also an interesting pattern in the discussions related to the interpretation of environmental cues. An environmental cue can be regarded as any sign or occurrence in the environment, which is perceived by an individual as being an indication that a hazard threshold can be, or is about to be breached. In this broad context participants indicated that they rely on many different cues to formulate their risk perceptions. These too, appear to influence both personal perceptions and actions. Environmental cues are, however, not only understood as relevant to future events. In

all three towns there was an acknowledgement that past extreme events have left a clearly identifiable legacy for the contemporary communities:

> MbM2_03: "It's filled the cavities, [so] my house was suffering from the after effects of hydroscopic salt for quite a long time. And it wasn't until they came to do the cavity wall insulation they realised they needed a skip to remove all the sand, wet salt sand, that had been there since 1953."

Despite the fact that individuals' own houses can act as a palimpsest, providing evidence of the extremity of past events, optimism prevailed throughout the discussions. Several participants, for example, expressed the belief that having lived in their town for 'X' years they knew the signs to look out for and, therefore, had a limited need to rely on either formal warnings or informal discussions:

> *Interviewer: So, you've got a week's [advance warning of a storm], do you actually use that week's notice to sort of talk amongst your group of friends or is that something that you just do for yourself?*
>
> MbM1_04: "We haven't /
>
> MbM1_01: / No, I don't think so, no. /
>
> MbM1_04: / because we take it with a pinch of salt that we've lived here long enough to know what a spring tide is.

Other individuals legitimised their personal perceptions of their own hazard awareness by introducing evidence of what could be construed as their 'expert' knowledge in relation to the local environment:

> ClM2_04: "The next high tide's a week on Thursday by the way, so you don't want a westerly storm then"

In accordance with the literature on flood warnings (Drabek, 2000), there was also clear corroboration that individuals did seek to confirm formal warning messages by checking environmental cues for themselves:

Interviewer: And yet 5 years ago only one gentleman actually responded to the sirens

MbM2_04: "Yeah, yeah

MbF2_01: Why is that do you think?

MbM2_02: Well I mean I went up on the top and had a look and I thought, well it's not as bad as they thought and / …

Interviewer: So whatever [warning] you get you are going to back it up with local knowledge?

MbM2_03: Hmm

MbM2_02: Yes

MbM2_05: You've got to, got to."

The evidence that these personal 'live-action' hazard assessments are part of normal behaviour in the coastal communities studied does raise a question. At what point would environmental information actually override some individuals' naturally optimistic cognitive biases that predicate that any situation is "*not as bad as they thought*"? Meyer (2006) suggests that humans are 'trial and error' learners. Therefore, he posits that the only thing people learn from being exposed to any series of near-miss or false alarm incidents is that all they need to know is that the worst will **not** happen. Despite this possible bias, some individuals did recall their positive initiations of protection measures, which accorded with recognised good practice (e.g. getting sandbags from the council in the days before a forecast storm or moving valuables upstairs). However, the prevalence was toward people not reacting to formal warnings with anything other than a personal (rather than social) assessment of prevailing conditions. From this it is possible to suggest that, even though the risks are widely acknowledged to exist, large numbers of households would only react to the threat of a flood with any conviction, once it was actually occurring:

MrM1_02: "I don't think that anyone's prepared in my street for a flood, meself included. If it did happen, there'd just be what I'd perceive to be a mad panic to get your electricals and stuff and your play stations and the computer upstairs."

This section has introduced the sources of information that are reportedly used to develop individuals' risk perceptions. The discussion will now move on to describe the perceptions of flood sources, their likelihood and their impacts; the dimensions of the risk.

7.4 The dimensions of flood risk perception

This section will investigate the respondents' knowledge, understandings and perceptions of flood sources (Figure 1.2) and how likely they think the flooding of their home might be. It also looks at perceptions of climate-change effects and whether these, too, are acting to influence individuals' risk assessments.

7.4.1 Flood sources

Before indicating how likely they thought it was that their homes would be flooded in the future, the respondents were asked to imagine from what source such an event might emanate. They were given a series of options and could suggest either single or combinations of relevant flood sources (Table 7.5).

Flood Source	Responses (*n*)	The Sea and other sources		Drains only		River only		None		Other (domestic)	
		f	%	*f*	%	*f*	%	*f*	%	*f*	%
All Towns	332	297	89	30	9	1	0.3	1	0.3	3	0.9

Table 7.5: Possible sources of flooding

Considering that all the respondents lived on the Environment Agency's delineated 0.5% flood zone, it is encouraging that 89% identified the sea as being a possible flood source.

However, differentiating this variable by town did result in the identification of a relationship, whereby, the Morecambe respondents reported the sea as a potential source less often, relative to the other towns ($p < 0.001$, with no gender or age differentiation). This difference, between populations, may be partially explained by the issue of source proximity discussed in Section 7.2; particularly in Cleveleys, where the whole sample lived within 500m of the sea wall (see Section 5.4). However, a percentage of respondents in Mablethorpe did reside further from the sea than did the whole Morecambe sample (≤1,400m and ≤800m respectively). Therefore, it is also possible that the standard of protection offered by newly constructed, concrete sea-defence structures in Morecambe could be perceived by more people as providing absolute protection from the sea (Messner & Meyer, 2005); whereas, the dune systems of Mablethorpe, or the older concrete structure along this stretch of Cleveleys' shoreline might not be so regarded. A more subjective interpretation of the low reporting in Morecambe relates back to flood history. It should not be forgotten that the flooding Mablethorpe suffered in 1953 was truly devastating in comparison to that suffered by either of the other towns, even in 1977. This would be an additional affecting factor to be accounted within each individuals' risk calculations (Erikson, 1994).

During the group discussions, the sea was always acknowledged as being a putative threat, evidenced, again, by fatalistic references:

> MrM2_02: "Yeah, I mean how high do you go, how high is the tide going to be? … Most of this town is, well, I won't say like Holland, but it's been reclaimed, you know, it really wasn't fit to be built on, it's not just this place there's loads of places, so one day it will be, it'll be taken back. That's the way of the thing isn't it?"

On the whole, however, there were much greater concerns expressed in all towns in relation to the likelihood of groundwater, drain surcharge or rainfall-generated inundations:

> MbM2_05: "Lower down, if you'd turned out of Wellington Road and went into Regent Road, there were houses there that were having to be pumped out purely and simply because they're lower than we are, and a bit further on they flooded in June, but it didn't even have to be as heavy as that. Down by the chalet park, Avenue Road, Those bungalows there /
>
> MbM2_03: / Oh yeah /
>
> MbM2_05: / they're only twenty years old and they still flood every time we have a reasonable amount of rain."

On another point, the threat of river flooding was indicated by solitary respondents in all three towns, despite the fact that rivers also present a significant hazard to them all. Only one respondent denied a source of flooding existed at all and three respondents suggested that only domestic piping represented a possible source.

7.4.2 Flood likelihood

After identifying flood sources it was then possible to investigate how likely the respondents felt it was that their homes would be flooded (Table 7.6):

	Responses (*n*)	Likely		Unlikely		Unsure		Never Happen	
		f	%	*f*	%	*f*	%	*f*	%
All Towns	341	165	48	126	37	51	15	2	0.6

Table 7.6: "How likely is your home to be flooded?" All towns

From the results it can be seen that 48%, felt that it was highly likely or moderately likely that their home could flood. When the sample was split, however, a significant difference was revealed between the three towns, with Mablethorpe and Cleveleys recording a

higher incidence of risk perception than Morecambe (χ^*). Once again the Morecambe sample stands out slightly from the other towns.

From a different perspective, the overall 48% 'likely' response is higher than the 30% of the population who had experience of previous floods (Section 7.3.3). However, in cross tabulation, only 59% of this 'flood experienced' sub-sample also indicated that they thought it likely that their home would be flooded in the future. Although, when analysed by town, those from Mablethorpe who had experienced flooding, were more likely to believe that their homes would be flood affected than those with similar experience in both other towns (χ^*). This brings us back to the issue of what confidence the respondents had in their towns' flood defences. By chance, major sea-defence construction work was actually occurring in both Morecambe and Cleveleys, concurrently with the fieldwork phase of this project. There was also clear acknowledgement – within the discussion groups at least – of the regular beach nourishment that seemed to epitomise the *Lincshore* project to the population of Mablethorpe (Section 5.3.2). So, regardless of prior flood experience, 48% of the population felt exposed to floods, despite such visual and tangible investment in structural flood defences. In fact, a relationship was found between the respondents' feelings of flood likelihood and their confidence in structural protection measures. Not surprisingly, there was a tendency for those who felt flooding was likely to also indicate a perception that the defence condition was inadequate ($p < 0.001$); one relationship that was statistically indistinguishable between the towns.

When asked why they held their opinion about the likelihood of flooding, those in the 'flood likely' sub-sample indicated a number of reasons why they understood their home to be at risk (Table 7.7). These reasons included, knowledge of the towns' prior flood

record, and the fact that nature is unpredictable (15%). Respondents also expressed their understanding that the topographical characteristics of the area in which they lived led to their inevitable exposure (i.e. flat land; close to the sea: 24%). No respondent expressly blamed any aspect of the design or condition of the structural defences; thus, there appeared to be an understanding of residual risk within this sub-sample.

Table 7.7: "Why do you think this?"
NB. Supplementary question to ""How likely is your home to be flooded?"

Coded response	Frequency	Percent
No; Too far from Sea / River	16	4.7
No; It's never flooded before	6	1.7
No; Because of defences / drainage works	68	19.8
No; Because it hasn't flooded in last (?) years	11	3.2
No; It's on the floodplain but it's unlikely	6	1.7
No; Because my home is higher than sea level / flood level	8	2.3
Sub-total: Unlikely	115	33.4
Yes; it's always possible / it's happened before	51	14.9
Yes; if drains overflow / land doesn't drain	16	4.7
Yes: Because we live near the sea / right weather conditions / flat land	83	24.2
Yes; due to global warming / sea level rise	15	4.4
Sub-total: Likely	165	48.2
Don't know / not enough info	15	4.4
Unsure but aware due to media / Emergency Planning 'push'	5	1.5
Optimism that it won't happen / Too many other things to worry about	2	0.6
People say it won't happen	1	0.3
Missing	40	11.7
Sub-total: Misc.	63	18.5
Total	343	100.0

Conversely, in sub-dividing the 33% who reported thinking flooding unlikely, the standard of protection offered by sea defences and drainage works was offered by 20% as the reason for confidence; this will be discussed in greater detail in Section 7.5.3. Another 4% indicated that it was because their house had never been flooded before, or because it was above flood level that they were optimistic. These particular feelings of confidence were, however, apparently underpinned by some very different reasoning. For example, some survey respondents cited direct and relevant local knowledge of their property's level of flood exposure:

> Surv_MbM-124: "Never flooded in 1953, house built higher up than others"
>
> [House situated – unusually in the area – up a short flight of steps above street level in Mablethorpe]

However, others gave the impression that they lacked knowledge of local history:

> Surv_MbF-110: "Looking at the history of the town, properties have not suffered floods"
>
> [Brand new bungalow situated within 200m of Mablethorpe sea defence embankment]

This last comment supports the suggestion that the low frequency of extreme flood events can act as an ameliorating influence when risk perceptions are cognitively or socially constructed by some people (Hofmann & Kaiser, 2007). For example, the fact was often cited in discussions, that it had been many years since the last flood event and this meant that fewer people regarded it as a major issue. It was also suggested that, for many people, these previous floods were regarded as events of historical interest (or disinterest), rather than as exemplars of the potential impacts of extant hazards. This point was exemplified during a group discussion about flood-related conversations within informal social networks:

Interviewer: Now, do you talk about flooding and the flood history of the town amongst [yourselves]?

MbM2_02: “Well we do amongst our friends

MbM2_01: Yes with our friends

MbM2_04: Yes with friends and neighbours

MbM2_05: Friends and neighbours /

MbM2_04: / and you talk to your wife don’t you /

MbM2_05: / because there’s nobody else basically that wants to talk about it.

MbM2_03: You try and talk [but] to the majority of youngsters and by youngsters I mean those, say, 40 and below [and they think] 1953 was ancient history.

MbM2_05: That’s right. Even last year when it was on the television for a week it was ancient history. People died, “So they died, people are dying every day.” That’s the attitude.”

As well as revealing certain participants’ perceptions, of how historical events are viewed dispassionately by ‘others’ in the community, what this last conversation sequence also highlights, is the belief that an apparent age differentiation exists in relation to who perceives flooding as a threat.

7.4.2.1 Age and gender

As a factor in risk perception, no relationship was found between age grouping and the perception of flood likelihood in the combined sample. However, this was not the case when the towns are examined independently. In Mablethorpe the respondents in the middle-age group are significantly more likely to be flood conscious than either their younger or older cohorts ($p < 0.05$). This finding, whilst only apparent in the single sample, does accord with Mileti *et al.’s* (2004) proposition, that it is the middle-aged who tend to be the most risk aware (Section 2.2.1).

As gender is considered to have an influence on risk perception too, cross tabulations were also performed with this variable. These revealed that there was a relationship between gender and feelings of flood likelihood ($p < 0.001$). In effect, this corroborated the literature, as there was an apparent tendency for women to have a higher risk perception than men. However, by investigating this gender effect between sub-populations it was found that this relationship was only significant at or below the 5% level in Morecambe and Cleveleys. This may be a sampling effect (Frankfort-Nachmias & Nachmias, 1996). However, taken at face value, it is interesting that Mablethorpe, which has suffered the most devastating historical flooding of the three towns, exhibits slightly less gender differentiation in flood-risk perceptions than do the others. Whilst this particular gender / perception relationship was apparent, no such differentiations existed between gender and perceptions of how a household might be affected by flooding. An 82% majority, of both females and males across all towns, considered that they would be seriously affected if their homes were to be flooded.

A perception that was often cited as a reason for individuals to not be concerned about the likelihood of sea flooding was that such an event was only seen as something that might occur at some undefined point in the future, i.e. for a variety of reasons it was not seen as a contemporary concern. This particular perspective opens up the analysis to the consideration of whether climate change is perceived by coastal communities as being a factor of concern in relation to current and future risks.

7.4.3 Risk perceptions of climate change

It has been projected that climate change will have an increasing influence on flood related risks during the next century and beyond (Alcamo *et al.*, 2007). In accordance with the implications of these projections, a series of survey items were used to ascertain how respondents perceived climate change and whether they considered it as a risk factor (Table 7.8).

	Respondents (*n*)	Agree %	Neutral %	Disagree %
Climate change is a real problem	331	76	15	3
I think it is clear that climate change is already happening	335	79	11	4
Climate change will do more good for [town] than harm	329	8	31	51
I have more to worry about than climate change	330	30	30	37
Climate change is already making flooding worse	328	66	6	6

Table 7.8: Responses from scaled climate-change statement question items

7.4.3.1 Climate change as a local issue

The survey did reveal that climate change is perceived as a concern by the majority of residents in these coastal towns, e.g. 76% agreed that it represented a 'real' problem, with women being more likely than men to hold this opinion (*X**). Furthermore, in relation to the temporal impact of potential changes, 79% agreed that climate change was already occurring, with only 4% in disagreement.

During the analysis it became clear that these perceptions were influenced by a range of factors; from personal observation, to the role of the media. From a personal

perspective, there was acknowledgement amongst individuals that local effects such as changing seasonality (Sparks & Smithers, 2002), were already clearly visible:

> MbM2_05: “The seasons have just gone
>
> MbM2_03: / I was just going to say /
>
> MbM2_04: / the seasons, you go straight into winter now don’t we?
>
> MbM2_03: Autumn’s arrived it’s in the papers this weekend. Autumn’s arrived two weeks early.
>
> MbM2_05: But if you look in the hedges and so forth, at the bird’s nests. Some of the birds have started laying again.”

More abstractly, there was a feeling that the reportage of climate change was almost ubiquitous across the media. This coverage appeared to be resulting in a general acceptance of the scientific consensus that changes are in progress (Oreskes, 2004):

> MrM1_01: “It’s … on every time you switch the television on, read the newspaper you get it on different things, it’s something that, I’m not an expert in it, I can’t see it actually happening in my lifetime but I think that from everything that we’re being told by the experts it’s not a matter of if, but when?”

On this individual level, however, there was also evidence of a range of perceptions as to whether climate change can be considered a ‘real’ phenomenon at all. Whilst some suggested that current extremes were merely part of the latest stage of a natural cycle, one discussant offered the currently overarching political framing of climate change (Rayner & Malone, 1998), as being analogous to the Cold War. His argument was that whilst he could not personally criticise the ‘expert’ science upon which the narrative was being built, he did feel that, whereas, as a child he had been afraid of ‘the bomb’, he perceived that his children were now being put in unnecessary fear of an intangible ‘climate’:

ClM2_04: "Oh don't worry about it son it's only a bit of water you know. It's not going to blow you up!"

On the whole, future climate-change impacts were perceived as being the inevitable consequence of a current lack of clearly visible global effort in mitigating greenhouse gas emissions:

MrM2_02: "… what we're playing at now like, trying to stop global warming is just not enough.

MrF2_03: It's too late.

MrM2_02: Well it's not enough anyway, because we're starting here but China's going crazy

MrM2_04: India's going crazy

MrM2_02: India's going crazy, what are we doing? It's just a ripple in the tide isn't it, it's nothing. But we've got to start somewhere I agree, but until you get everybody doing it ..."

On a local scale, 51% thought that climate change would bring more harm than good to their town and 37% considered it to be a principal issue of concern for them. These findings are interesting, particularly when it is considered in the context that climate change was mostly discursively framed by the participants as an issue predominantly affecting future, rather than present generations:

ClM2_01: "… it seems from the new reports that … sea level rise will be very gradual. So you get the feeling, well hopefully it won't be too much of a problem. I think they're talking about flooding by 20 feet in the next 50 to 100 years I think. Well it's okay if we say "Well, we'll be long gone and it won't affect us", kind of thing, but obviously we have to think of future generations and what will happen to them."

Such statements call into question whether the application of the Cold War analogy to climate change (in the sense of it being something only perceived as manageable through centralised command-and-control type institutions) might actually be apposite for

a larger proportion of the sample. The importance of global collaboration, as a prerequisite for future reductions in local climate-related risks, was recognised. However, many individuals appeared to feel concerned about, and yet disconcertingly estranged from, both the scientifically framed and caveat-laden climate projections, and the politically negotiated emissions-mitigation process (Dessler & Parson, 2006; Lorenzoni *et al.*, 2007). Indeed, in the face of such a meta-narrative it is not hard to see why some individuals invoke dissonance or optimism as an effective self-protection strategy. People can feel powerless to influence something that they perceive as a global rather than a local problem and as such, it is easier for them to deny personal responsibility or personal efficacy in relation to its mitigation (Lorenzoni *et al.*, 2007; Stoll-Kleemann *et al.*, 2001; Uzzell, 2000).

It could be suggested that understanding climate change as being solely an issue necessitating emissions reduction does, however, fail to acknowledge the potential utility of proactive, private adaptation by flood-hazard exposed communities. Particularly when near-term projections suggest that a certain amount of adaptation must be regarded as essential, regardless of any reductions in emissions that may be achieved in the years and decades ahead (Pielke Jr. *et al.*, 2007).

Having discussed perceptions of climate change from an emissions-mitigation perspective, the next section investigates how it is perceived as a possible driver of local flood-risk and whether this possibility is implicitly or explicitly acknowledged by the hazard-exposed populations.

7.4.3.2 Climate change as a local flood-risk factor

Thinking of climate change as something that is already occurring, rather than a future concern, 66% of the sample indicated their belief that it was already making flooding

worse. Although only 6% were in disagreement with this belief (Table 7.8), women were found to be most conscious of it overall (p = 0.05). In the discussions, however, flood sources that could be said to be influenced by climate-change effects, were separated into particular time windows. On the one hand, rainfall was perceived as a hazard that had already appreciably increased in intensity during recent years:

> MbF1_05: "I mean torrential [rainfall] is normal now isn't it!"

On the other hand, sea-level rise (SLR) and the increasing risks associated with flooding from the sea were regarded as influences and impacts to be viewed as affective in the long term, rather than the short:

> ClF2_03: "I mean they say the sea level's going to rise and some of it you think 'it can't be true' but it probably will be, but how that would actually affect it, it's not going to be, you know, you can go out and measure on a stick sort of thing, "Oh look the sea's three feet above that rock now!'"

Perceptions of how much SLR might become a problem in the future differed considerably, with only 4% considering it to be the principal forcing of increasing flood risks (Table 7.7). There were a range of views expressed in this regard, which were undifferentiated by age or gender. These varied, from scepticism that it would be a problem at all (relative to the increasing protection standard of structural sea defences), to suggestions that the credible projections of SLR for this century have been anything from ~6m to 25 metres[3].

[3] IPCC projections regarding global sea-level are for a rise of between 0.18m – 0.59m by 2095, dependent on emissions scenario and not including dynamical ice mass feedbacks (IPCC, 2007). Rahmstorf *et al.* (2007), by contrast, use recent observations to project a rise of between 0.5m-1.4m in this timeframe. More recently, Pfeffer *et al.* (2008) have suggested a *most likely* scenario could be a contribution of 0.8m from the Greenland ice-sheet (GIS) alone, but that if all physical variables accelerate to extremely high limits then a 2m rise is plausible during this period, even if it is very unlikely.

The general perception was that the timescales projected in relation to SLR meant that it is not yet perceived to be a direct threat to coastal residents (see also: Kaiser *et al.*, 2004):

> MbM2_04: "Well … I feel that it's only a matter of time before the sea starts eating up a lot of the coast. It won't be in our time but I think it will happen."

The increasing intensity of windstorms (the driver of storm surges), which has been experienced (UKCIP, 2007), and which is also projected to continue as a result of a changing climate (Beniston, 2007; Hulme *et al.*, 2002), were never explicitly identified or discussed. However, perceptions of changing rainfall intensity did, without doubt, elicit concerns. The increases in precipitation that respondents claim to have personally experienced over recent years, have apparently acted to change peoples' perceptions of their own vulnerability:

> MrM1_01: "It's always been quite temperate, it might have rained a lot but you know what I mean, it's never been at one end of the scale in this country, usually. I think that's going to start changing and I think that what we've seen will be more prevalent, I think we'll see more of it unfortunately."

That this is the case is interesting, because recently published trend analyses have revealed that it has been hard to quantify any changes in UK precipitation trends, since records began in 1766, with any robustness (UKCIP, 2007)[4]. That precipitation was mentioned by so many focus-group participants is also revealing in another sense. These discussions occurred soon after the UK floods of summer 2007. From a scientific perspective, the causal rainfall for these events was subsequently attributed to natural variability, rather than to climate change (CEH, 2008). Therefore, even considering that

[4] *NB.* Although, the contribution of heavy precipitation events during the winter has appeared to increase by 5%, from 7.5% of the total in the 1960s to 12.5% in the decade ending 2006 (UKCIP, 2007)

these events were more likely attributable to 'weather' than climate, they still appeared to elicit cognitive availability, through which participants could justify their personal climate-related concerns.

Expressed perceptions of flood sources, drivers and likelihood have now been discussed. The final section of this chapter will initially investigate the respondents' knowledge of their local flood warning systems, before going on to examine their potential responses to those warnings.

7.5 Awareness and preparedness

An important factor that predicates the success or failure of any Flood Forecast, Warning and Response System (FFWRS), is the publics' understanding of the warning it generates and, importantly, how the at-risk public should respond to this 'action statement' (Handmer, 2000; Parker, 2003). Accordingly, this section will investigate the population's knowledges, of both the warning systems that are in place within their communities, and the self-protective actions that they report they could take upon warning receipt.

7.5.1 Knowledge of flood warnings

When asked if they thought they would receive a flood warning prior to an event, 79% of respondents felt that they would, with 21% either believing that they would receive no warning or being unsure (Table 7.9). Interestingly, it was the older age group (60-75+) who most often reported the belief that a warning would be received (X^*).

Peoples' perceptions of the warning sources are quite different depending on the town. In Cleveleys 45% were confident that the Environment Agency would be the principal source of the warning, with the media in second place with 18%. In Morecambe these

percentages are slightly reversed, with the media leading the Agency as principal source. In Mablethorpe the situation is completely different. Here 71% understood that the network of sirens situated around the town would provide the initial warning, with only 20% expecting the warning from the Environment Agency, Local Authority or media sources.

	Total		Cleveleys		Mablethorpe		Morecambe	
	Freq	%	Freq	%	Freq	%	Freq	%
EA FWRS	87	25	56	**45**	5	4	26	**26**
Media (Radio/TV, inc. weather reports)	64	19	22	**18**	11	9	31	**32**
Local Authorities	24	7	9	7	8	7	7	7
Loud Hailer	2	0.6	1	0.8	1	0.8	0	0
Informal (e.g. neighbour)	2	0.6	1	0.8	0	0	1	1
Siren	91	27	5	4	86	**71**	0	0
Total respondents who expect a warning	270	79	94	76	111	92	65	66
Do not know / Unsure / No warning expected / Missing	72	21	29	24	10	8	33	34
Total (*n*)	342	100	123	100	121	100	98	100

Table 7.9: Anticipated Flood Warning sources

The warning sources that were identified will now be discussed from two perspectives: (1) whether the cited sources do in fact represent the most likely formal warning source in each town and (2) in terms of each of these source's local limitations, as they were described during the key-informant interviews.

7.5.1.1 Sirens

Although it is recognised as being the principal source of flood warnings by 71% of the Mablethorpe sample, the siren system operating there does have recognised performance limitations (Alexander, 2002):

> MbM2_02: "We'd got the television on and you know it was only in the quieter periods of the television programme that you could hear [the siren], you know, the double-glazing. Then again you don't have a window open in the winter so, you know, the double glazing shuts the sound out."

Furthermore, despite regular awareness campaigns, the actual '**Go in, Stay in, Tune in'** message that the system is intended to convey is not widely understood. A suggestion as to why this should be so was made by an Emergency Planning Officer:

> Key_Mb01: "… there is a perception, I'm sure, that if the sirens go [off] it can stop the flooding, which we know … is blatantly ridiculous, it doesn't work that way, and there is a great deal of satisfaction, I feel, that people locally get from knowing that there is a warning system in place. Even if there was a better warning system it wouldn't be the sirens and they wouldn't have the confidence that they seem to have in an ineffective siren system."

This, and the fact that the devices themselves are obsolete[5], leads some key informants to perceive sirens as being anachronistic. However, despite their limitations, the sirens are regarded positively by the population, as being the ultimate signal to "*get off your backside and actually do something*" (MbF1_05), even if these 'somethings' do range, from little more than message confirmation, to the actual initiation of protective measures. In corroboration of this popular support, formal plans to remove the sirens have been met with vociferous opposition along this coastline (Key_Mb01 and NNDC, 2008). In Morecambe, where no flood sirens operate but where residents have some familiarity with the on-site warning system used at the Heysham nuclear power station[6] (British Energy, 2007), discussants had mixed feelings about their efficacy. Whilst sirens

[5] The siren system was handed over to the Local Authority by the Home Office in 1992. Until this time the sirens had formed an integral part of the Civil Defence nuclear strike early-warning system. The siren devices themselves date back many decades and are of a design and type which is now obsolete, from the perspective of either sourcing parts for maintenance or unit replacement. Modern systems do exist. For example the new system which has recently been commissioned in Grimsby, at a cost of £750,000 (E.A., 2007c).

[6] The Heysham power station siren is intended for on-site operations only. Off-site warning arrangements are for: AVM to those who are registered, loud-hailer patrols and local radio/television. The only recommended action to be taken in the event of a warning from the site is 'Go in, Stay in, Tune in' (British Energy, 2007)

were seen as being a potentially effective warning technology, it was also suggested that they should only be regarded as a warning of imminent hazard impact (i.e. ~20mins), as any prolonged usage could rapidly lead to the aggravation of those exposed to the noise and, as a result, a reduced response when it was actually needed. Limiting the use of such a measure to a very restricted time frame would, however, inevitably increase the likelihood that the system would be activated too late to be of benefit:

> MbM1_04: "You'd know it was imminent that's all you would know and then the sirens would go and then you've got to act because you can't wonder around waiting for the sirens to go.
>
> MbM1_02: That's why Louth has such a problem because they were all whinging like mad the sirens didn't go off in time [during the summer floods], to give the people time enough to up sticks and get the hell out of the way."

7.5.1.2 Environment Agency: FWD / Floodline

The Environment Agency operates their opt-in *Flood Warnings Direct* (FWD) service in the high-risk zones of all three towns; complemented by the national *Floodline* service (Chapter 5). FWD is, however, only offered to a fraction of the actual sample population. Accordingly, the relative rates at which these systems were cited in Morecambe and Cleveleys (Figure 7.5) caused some surprise, when the data was shown to an Agency staff member responsible for flood incident management in the two towns:

> Key_Mb02: "What strikes me immediately is why [in Cleveleys], where they have no direct service, they are more aware of the Agency's role in warning than an area that is offered a direct service. It should be the other way around. In the Cleveleys area they need to be more aware of media!"

This is an interesting dilemma, which is best understood by referring back to the two respective samples' assessments of local environmental issues (Section 7.2). As only 15% of respondents in Morecambe perceived flooding as a top-three concern, the fact that this population tended not to be aware of who is responsible for issuing warnings

should not be a surprise (Ipsos UK, 2006). In effect, there appears to be higher dissonance within the Morecambe population, whereas, in Cleveleys there appears to be greater seeking and knowledge of available warning sources. It could, however, be argued that the hazard proximity again provides an extra imperative in Cleveleys (Section 7.4.1).

An important aspect of vulnerability was brought out during a discussion of leafleting campaigns. One participant clearly illustrated how, in households containing someone with limiting illness, it is not only a vulnerable individual who can miss the content of formal risk communications, but also the household more generally:

> ClM2_01: "I remember it coming but I've been looking after my mum who's got Alzheimer's, so you know the paperwork just gets stacked up and you just, well, [it's] not a priority so it's something you don't look at."

Past experiences with the Agency's warning systems and operations were discussed, partly with the intention of finding if these messages had been interpreted personally, or through informal social interactions (Section 7.3.3). There was an acknowledgement in all the groups that environmental cues, rather than informal discussion, are used as a form of direct confirmation after formal warning messages are received. There was also a suggestion that these cues were checked explicitly in order to ameliorate concerns over perceived deficiencies in the Agency's service:

> *Interviewer: So given the fact that you may have a higher tide coming in and a hypothetical storm … whose opinion would you go by that there might be a problem?*
>
> MrM1_02: "You know it's possible when they, here in Morecambe, when they put the shutters [the stop logs in the defences] across … /
>
> MrF1_03: / Yeah, and when they put the shutters across that's when *Floodline* ring you and then I sort of go and have a little look at it myself and see what I think because having lived here for 18 years you know, you do watch the clouds and you watch the sea and you

> sort of make a judgement and I decide whether I need to get my plastic boxes out of the loft. But *Floodline* don't tell me that I ought to get my plastic boxes out of the loft and no one's knocked on the door since 1988 telling me to prepare to repel flood water."

There was no clear evidence that warning receipt had ever led to 'garden-gate' style social deliberations between members of informal networks.

7.5.1.3 Media

Whilst it was cited most often as the principal warning source in Morecambe (32%), the broadcast media was regarded as being an important indirect source of warnings in all the towns. During most group discussions, local radio, particularly, was singled out as being the most effective means to update the population during rapidly changing circumstances. Even in Mablethorpe, where the 'Go in, Stay in, Tune in' intent behind the activation of the sirens was misunderstood by so many, local radio was regarded as being the most effective media-based source of hazard information, both during events and as an awareness measure (See also Section 7.3.1.1):

Finding such positive support across a number of exposed communities, for the warning potential of such a well-tried and high performance broadcast media, is important (Tapsell *et al.*, 2005). More than anything, this knowledge could allow Local Media Emergency Forums (HMG, 2005) to have confidence that there is a high expectation that local radio will be used as a means to pass information during emergencies. Thinking of Mablethorpe in particular, there is a suggestion that, whilst sirens are cited as the principal warning source, the respondent's comfort with the everyday functioning of the news media, means that tuning in to the '*friendly voice'* (Pitt, 2008: p.342) of local radio may actually be many individuals' natural confirmatory response upon hearing this first alert (Granatt, 2004). However, the evidence indicates that this action will more likely be

made as a personal choice, rather than as a response learnt, by rote, from any prior awareness-raising campaign (see Bonner, 2007 for examples).

7.5.1.4 Informal warnings

Across the three towns only 2.4% of respondents thought that an informal social contact, such as a neighbour, would be their initial source of a warning message. This finding runs contrary to the literature, where evidence suggests that, post-event, between 50% and 75% of the affected public report having received their first warning from an informal source (Parker & Handmer, 1998; Spence *et al.*, 2007). That the populations of these towns have a tendency to trust the effectiveness of formal warning systems to meet all contingencies is perhaps not surprising. In all the focus groups, the undeniable improvements in warning technologies that have been achieved during the past few decades were recognised. However, the fact is that these communities have not suffered a major hazard event for many years and, therefore, they have not borne witness to a 'real time' test of these formal systems. As stated above (Section 7.3.4.2), this means that in some respects they have gained confidence in these systems' ability to warn of things **not** happening (Meyer, 2006). This is an issue, because it is generally only during a 'live' major event that the limitations of formal warning systems and the uncertainties inherent in their operation become manifest, and this is often to the shock and surprise of what can be an over-expectant public (Clarke, 1999).

7.5.1.5 Sources of assistance

In addition to the investigation of cited warning sources, the survey also asked to whom people would go for **help** during a flood. In all, 56% stated that they would seek initial assistance from formal sources, such as the Emergency Services or the Local Authority, including 9% who would telephone the *Floodline* advice service. Only 25% stated that their first request for assistance during a flood would be to an informal contact, such as a

family member, neighbour or friend. This result too, contrasts with the findings of post-event research, which suggests that during hazard events up to 90% of the public's immediate needs are met by informal sources of aid (Helsloot & Ruitenberg, 2004; Quarantelli, 1999). Again, possibly due to lack of direct experience, this population appears unaware that if a major hazard occurs, particularly over a large spatial area, the emergency services will, invariably, prioritise their limited resources toward immediate risks to life and to tasks of high strategic value (Clarke, 1999; DCLG, 2008). The corollary of this is that householders and neighbourhoods can often find themselves coping with locally-ferocious hazards with little but their own ingenuity, during the early phase of any flood emergency (King, 2000). This fact is acknowledged within the proposed National Flood Emergency Framework (Defra, 2008).

> "In some parts of the country, people and communities might have to manage the immediate response for the first vital few minutes. Local communities are often best placed to know the location of important infrastructure or assets and vulnerable people. Communities will be encouraged to develop this concept further and undertake preparatory activity before an incident occurs." (*ibid*: p.12)

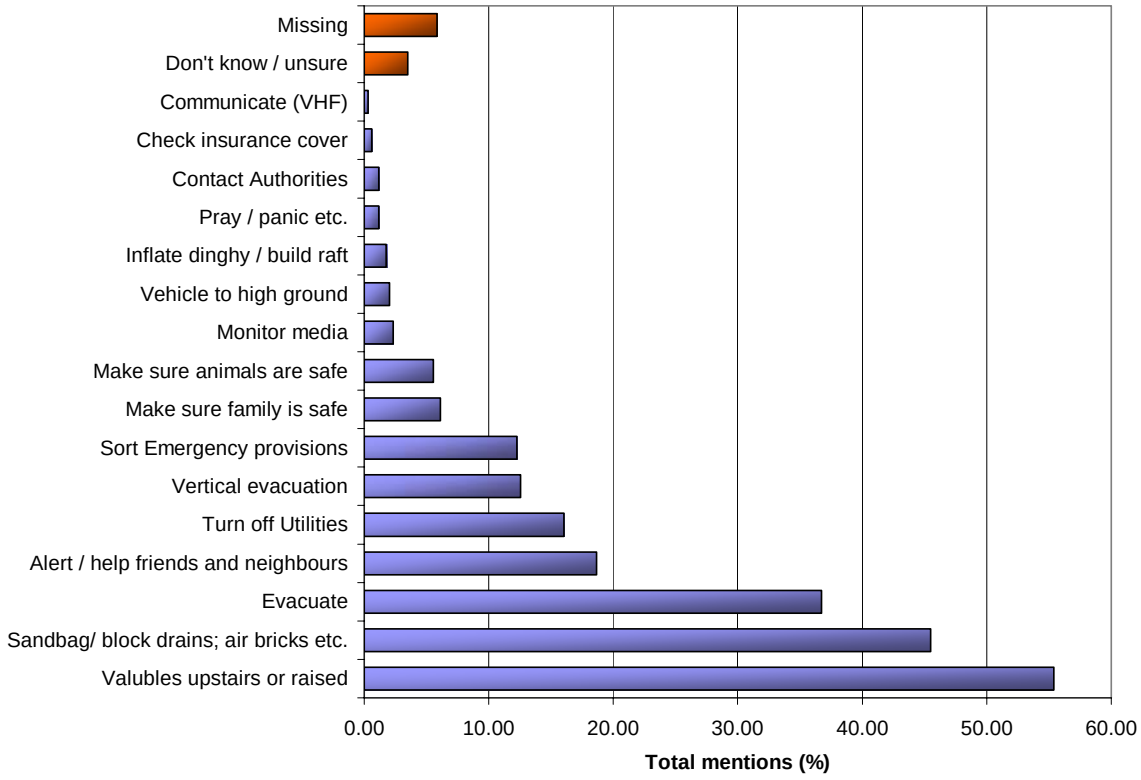
Although knowing where people expect a warning to emanate from and to whom they would go for help is useful, what analysis of these responses cannot investigate is the range of public perceptions as to what the intended action of the individual should or would be upon warning receipt – the Mablethorpe sirens have already been discussed in this context. The next section reports the responses that people suggest they could initiate if they believed they were going to be flooded within the next few hours.

7.5.2 Potential self-protective responses

In acknowledgement of the criticism directed at other surveys (see Section 4.6.1), the item asking respondents to list up to three actions that they could take if they believed

that they were about to be flooded, was designed to elicit unprompted responses (Figure 7.8).

Figure 7.8: Coded responses; percentage of respondents who identified 1 to 3 protective actions they could take if their street and home were about to be flooded



All but 13% of the population spread across the towns, could think of at least one action. These ranged from the most popular, ‘raising valuables’, to one person who stated that he would commence monitoring the emergency frequency on the RAYNET amateur radio network (Raynet, 2008). These actions will now be discussed in more detail.

7.5.2.1 Raising valuables to safety

The most practical and common-sense action cited was, 'raising possessions above the expected flood level' (55%). In discussion, one participant even revealed that he already kept valuables upstairs, specifically in order to reduce the risk of losing them in a flood:

> MbM2_03: "Personally … as a matter of course all our valuables are upstairs.
>
> MbF2_01: You see ours aren't are they!
>
> MbM2_03: And all our photographs are upstairs.
>
> *Interviewer: This is a particular response to where you live?*
>
> MbM2_03: Yeah, in that in some respects I value my photographs, family photographs, as being far more important than some things like a passport because I can always get a passport."

Raising valuables was not, however, considered to be an option available to everyone. Elderly people were viewed as being potentially too frail to lift anything other than small items to safety. Such vulnerability could also be exacerbated by the fact that many of the Mablethorpe and Cleveleys residents live in bungalows with only limited loft access. When speaking of larger items of value, the practicality of raising heavier items resulted in some polarisation. The role of insurance was central here, and particularly the issue of moral hazard; i.e. "*the tendency of insurance protection to alter an individual's motive to prevent loss*" (Shavell, 1979: p.541). Whilst one participant felt that having insurance meant that there was no need to worry about saving material objects from contaminated floodwater, another believed that the more that was saved, the less likely it would be that future insurance premiums would be affected:

> MbM2_03: "Putting my furniture on a brick would come very low on the priorities if the house was being flooded.
>
> MbM2_04: Would you do it if you had time?

MbM2_03: Not particularly.

MbM2_04: Because you want to keep your furniture out of the water if you can?

MbM2_03: My contents, that's why I pay house and contents.

MbM2_04: If your contents are insured and they've got to pay you out thousands of pounds 2 thousand, 3 thousand pound it affect everybody else by putting their premiums up so it's best to take.

MbM2_03: Yeah, alright, your house has flooded say up to half the side of that brick. Remember there's not just seawater coming through there's sewage coming, are you going to sit on that settee afterwards?

MbM2_04: If it's not contaminated yes, if it's not contaminated.

MbM2_03: Oh, I don't think so, no."

Aside from this moral issue, insurance is discussed in greater depth in Section 8.2.1. However, returning to raising valuables, another limitation of this response was also highlighted. This referred to the fact that lifting everything above expected flood height would be difficult for many of those in these communities, whose houses still bore flood marks up to 1.5m above ground-floor level.

7.5.2.2 Sandbagging ... etc.

The second most popular response type involved actions aimed at preventing water ingress into the building. Actions coded under this category included sandbagging, the blocking of air bricks and drains, or the use of flood boards (45%). The two most popularly mentioned measures were sandbags and home-manufactured airbrick covers.

There was an implicit understanding by most people that sandbags only provide modest performance as a form of flood protection at the domestic level (Reeve, 2003). However, there was no clear evidence that any respondent had purchased any other type of branded or BSI 'kite-marked' flood defence product (Crichton, 2003). This is something

that may be partially explicable, by these products being considered to have a "*fantastic price"* (see Section 8.2.1). Only one participant stated that he would use sandbags in combination with other defence measures:

> MbM1_02: "So we've got a sandbag system, some bags ready, the house is walled all around, right, which will delay things, it won't stop it. If the inundation comes from the drainage side then, that's it, there's nothing I can do about it, if it comes from the seaward side, okay, I've gained maybe 20 minutes time to gather things together, employ the emergency plan"

Overall, the local authority was seen as being primarily responsible for the supply of sandbags. Whilst some participants stated that they had collected, or that they would travel to collect, sandbags from a council depot themselves, the consensus was that there were systems in place to deliver these bags when they are needed. Whilst such systems do currently exist, the sustainability of this apparent reliance on the local authority was challenged by key informants:

> Key_Mb02: "I mean, from experience … in the first quarter of an hour of a flash flood hitting, Fire & Rescue Control will probably take about 100 calls from people wanting sandbags which we then pass on to the relevant District Council … if you're number 90, or number 80, on that list it's going to be too late by the time you get the 'magic' sandbags that hold the water back."

> Key_Mb01: Frankly, if you're number 1 on that list it'll be too late … because by the time you realise it's going to flood or it's flooding you phone the Fire Brigade and say can you come and pump this water out. The Fire Brigade then say to us "Can you come and put some sandbags down here?" Yeah, okay but it's already here. It's too late!"

As an example of current practice, East Lindsey District Council explicitly state in their public information literature that they will only deliver sandbags, on a basis of priority and effectiveness, during a **declared** 'Severe Flood Warning' (Appendix 7) and not as a contingency against such an alert level (ELDC, 2008). These practical and policy-defined limitations, on the assistance that would actually be available to households

during a flood emergency, appeared to be unknown or unconsidered by most focus group participants.

Moving to more permanent measures than sandbags, there was evidence that several individuals had already fitted pumps beneath their homes in order to relieve their foundations of chronic groundwater flooding. Such measures were, however, acknowledged to be incapable of protecting against extreme flooding:

> ClM1_01: "The problem is [with] serious flooding and whether you've a pump fitted or not, there's nowhere to pump it when it's that serious. If it's a flash flood … or if the sea defences were breached, it's pointless pumping it anywhere because everything else is, the drains are backed up."

Overall, there appeared to be ambivalence toward the need for the anticipatory sourcing of resilient protection measures. The general perception appeared to be that such measures would be made available when the time came; an issue that will be discussed further in Section 8.3.1.

7.5.2.3 Evacuation: vertical and to a 'place of safety'

The third most popular response to this question was evacuation of the home (37%), with 12% indicating that they would evacuate vertically within their residence. That such relatively high numbers of residents would apparently consider household evacuation as a preferred action, suggests that it is likely to be risk perception that dictates their understanding of this measure. This suggestion is supported by the fact that other researchers investigating, predominantly, low-probability fluvial flood risks (which, apart from flash floods, are regarded as presenting a lesser risk-to-life than sea flooding, Ramsbottom, *et al.*, 2003), reported that only 16% of their sample considered household evacuation, against 17.8% citing vertical evacuation as an option (Shaw *et al.*, 2005). Considered from this perspective, it is perhaps not surprising that household evacuation

is particularly highly cited in Mablethorpe (44%), where experience of the 1953 flood is undoubtedly inhered within local folklore, and Cleveleys (35%), where straightforward hazard proximity is harder to deny. These perceptions are also possibly related to the additional fact that so many people in these towns live in single-storey buildings that offer little opportunity for vertical escape anyway.

Emergency planners have been tasked to plan for evacuations by identifying evacuation routes. However, whilst the need to plan for such a contingency is acknowledged by the staff, there is a certain amount of frustration that the Civil Contingencies Secretariat (CCS) and Government Office for the Regions (GO), in particular, do not appreciate the enormity or complexity of the task:

> Key_Mb01: "That's [the message] coming from CCS through GO East Midlands to us ... It's all come back to [the local scale] saying, "Right I want you to identify evacuation routes in flood plain areas!" If you get a breach at Mablethorpe that takes us up to sort of North Kyme, you know and everything between here and [50 miles around the coast to] North Kyme is going to be a meter under water, so what is the point of identifying evacuation routes? I see what they're getting at, I see the point, but it's a rather bland question and that's just one example of how central government through GOEM in our case, the regional government is saying "Don't argue just give me the answer!"

Quite correctly, the high density of single-storey buildings along the coastline is considered within the government's evacuation guidance as presenting a particular challenge to emergency planners (HMG, 2006). Therefore, knowing that so many people do consider household evacuation to be a preferred response option is useful, because it means that responding agencies should make contingency plans aimed at controlling spontaneous evacuation, and reducing, where at all possible, the potential for traffic congestion (King, 2008). This is important because large numbers of people driving on flooded or flooding roads would present a serious risk-to-life during an extreme event (Drobot *et al.*, 2007).

However, an important consideration in this discussion is whether people really would behave as they suggest and spontaneously evacuate **prior** to a storm-surge flood. Whilst some discussants in each town suggested that upon receipt of a warning they would, in effect, "*pile everything in the car and head for high ground*", a different message emerged in relation to the point at which this might actually occur. In fact, the evidence suggested that if left to their own devices only a minority of people would even consider evacuation (King, 2008). Taking the most recent siren warning that was remembered as occurring in Mablethorpe as a **key event** (see Section 4.9.2); firstly, as was reported in Section 7.3.3.2, only one of the participants took that particular warning seriously enough to start protecting his home from the forecast flood water. Secondly, nobody on that occasion actually reported considering evacuation. Rather, at the most, respondents reported checking for environmental cues to confirm or challenge their personal interpretation of the warning they had received. One person even described the sea conditions during that event as providing "*no leeway at all*" (MbM2_03), and yet he still had not considered evacuation. Most of these individuals, therefore, illustrated an optimistic confidence in their structural sea defences. This could be regarded as a 'false security effect', which has acted to negate perceptions that anything other than (availability biased) confirmatory actions are necessary when a warning is heard (Kahn & Luce, 2006). In effect, there appears to be a gap, whereby expressed intentions have apparently not been evidenced by examples of corroborating behaviour (McKenzie-Mohr, 2000). Given the evidence from these groups – and the social-network effects discussed in Section 2.3.1.2 – it could be suggested that even though people say they would evacuate spontaneously upon receipt of a flood warning, it is unlikely that this would actually happen without significant prompting from the warning agencies.

7.5.2.4 Informal social responses

In total, actions that could be regarded as checks on, as warnings to, or as assistance to, other members of respondents' immediate family or neighbours, were mentioned by 25% of the sample. This relatively low figure again contrasts with post-disaster literature, which has regularly identified that the social processing that surrounds the confirmation of an initial warning would itself result in higher levels of interaction than this finding suggests (Cordasco, 2006; Drabek, 2000; Mileti & Sorensen, 1990). For example:

> An initial first-warning response is to seek more information and confirm the initial warning, and people often contact others in this seek-and-confirm process. Some of these contacts spread warnings to persons not yet aware of the emergency. The result of either type of informal warning is that people in the public help to warn others. (Mileti & Sorensen, 1990: p.2-11)

In addition to this warning function of social contact, Thrush *et al.* (2005) state that neighbours have been of considerable assistance during flood events, particularly to elderly or other vulnerable people. Responses in this vein were evident within the discussions. However, there was an implication that during a rapidly escalating event, the granting of assistance by some individuals might only be considered for specific neighbours and relations within local social-networks, rather than more generally:

> MrM1_02: "I'd like to think that … I've got a few neighbours very close to me, you know, who made me feel welcome when we moved … and I'd like to see if they'd heard the news and that and then [I'd] be off, smoke behind me [laughter], off up the hills. I wouldn't, well, at that time I wouldn't be bothered about further afield, apart from me Mum and Dad really."

For others, local social capital (i.e. the networks and norms that facilitate collective action) was viewed as something that, in such circumstances, would provide a spirit of altruism, which would be capable of absorbing even the most vulnerable community members into the response effort. In effect, there was a perception that a therapeutic response would emerge from the existing community order (e.g. Barton (1969), cited in:

Miller, 2007). In cross tabulation it was found that, once again, it was the oldest age group (60-75+) who had the most confidence that this therapeutic effect would materialise (*X**). In the discussions, however, a caveat affecting this potential effect appeared to be that the amount of warning lead time could constrain the amount of altruistic activity that could be achieved:

> MrM1_01: "If it was like a flash flood I think it would be every man for himself kind of thing but if there was sufficient warning I think people would make sure, you know, the elderly people on the street, and there are a few of them, I think people would make sure that they're alright as far as they could, assist them, I'd like to think that I'd feel confident that that would happen."

7.5.2.5 Other responses

In total, 86% reported actions that accorded directly with those included within formal Environment Agency advice e.g. turning off utilities, moving vehicles to high ground and ensuring animals were safe (E.A., 2008). This is not to suggest that this high proportion of the population was wholly familiar with Agency advice, but more that these particular actions appear to be broadly based on common sense. Of the total, 80.5% reported that they would consider implementing one or more of the top-three cited actions (i.e. raising valuables, sandbagging etc. and evacuation), and whilst some other actions were based on practicality (e.g. inflating a dinghy: 2%), a few were explicitly fatalistic (or ironic) in nature (e.g. pray: 1.2%).

This chapter section has discussed the reported actions that respondents considered they might implement upon receipt of a warning. These findings and those from the earlier sections will now be summarised, before the discussion moves on (in Chapter 8) to investigate the ways in which this population perceives that their households' and their communities' resilience to future hazards might be increased.

7.6 Key findings

Whereas, Chapter 6 was concerned with using quantitative methods to build a picture of the population sample's vulnerability and social-networking characteristics, this chapter has focused on the investigation of the respondents' own, more qualitatively derived, perceptions of risk and resilience.

Very quickly it was discovered that the samples recruited in the three towns perceived flooding quite differently. In Mablethorpe and to a lesser extent in Cleveleys, flooding was regarded as a real concern. In Morecambe, this was not the case, with only 15% regarding it as a top-three local environmental issue. This differentiation between sub-samples was to appear at numerous points throughout this chapter, as the Morecambe residents revealed themselves to have apparently different perceptions of several aspects of flood risk than those of the other towns.

Overall, it was clear that flooding was an issue whose reporting had been seen widely across a range of media, with this coverage resulting in 45% reporting changed perceptions of personal risk. This appeared to be a greater effect than that reported from discussions amongst personal networks (21%). Generally, where an effect was reported, it tended to result in an increase of risk awareness. Conversely, however, informal discussion did result in an amelioration of risk concerns more often than was reported from media coverage. Very few people within this population had sought expert advice in relation to flood risk, although significant numbers of people had spoken about it with their partners or friends and neighbours. Flood discussions, therefore, occurred predominantly within bonded or bridged social networks rather than across institutional hierarchies. Whether the lateral nature of these network discussions meant that opinions were sought from others on the basis of a confirmation bias, rather than to test a

preconceived opinion, was not clear. However, 77% indicated or implied that their opinion had not been changed by discussions on the subject.

In relation to the identification of the potential sources of flooding, a large majority identified their exposure to the sea; with 48% claiming that they thought it 'likely' that their home might actually be flooded. Overall, those with prior flood experience (30%) were found to be more risk aware and knowledgeable of potential protective responses than those without. However, the fact that many of those with experience still regarded flooding as unlikely may have been partially explained by the fact that the sheer scale of sea-defence construction in the three towns had reduced the idea of sea flooding, for them and others, to the status of historical interest. In Mablethorpe alone, a respondent's age influenced his/her perception of risk; with the middle-aged appearing to be more risk conscious. In relation to gender, it was only in Mablethorpe where women were not found to be more risk conscious than men. In the other towns this gender effect corroborated the literature.

As far as the majority of the population was concerned, climate change is perceived both, as already occurring and as a major problem. In fact, for 37% it is regarded as a principal concern. Some shifting of responsibility was evident, however, in that climate change was seen as a global issue requiring global effort for its remediation; with little action perceived as being possible at a local scale. In terms of flood risk it was the perceived increases in rainfall intensity, rather than in storminess or sea-level rise that was seen as the primary concern.

In relation to flood warnings, each of the three towns reported knowledge of different FFRWS systems in operation. In Mablethorpe, sirens were acknowledged to be the primary warning to "*actually do something*"; despite the fact that the system has a

number of limitations. In the other towns the Environment Agency's system was regarded sceptically, with there always being a need to confirm whatever message was received. Local radio, once again, received popular support in relation to its operation as an indirect warning source. There was an overall confidence in the fact that formal systems would operate effectively during a major event and this meant that warnings and assistance would be forthcoming upon need or request; this is contrary to the findings of previous 'post-event' research.

Overall, in reporting potential responses to a flood warning, the common-sense responses were the most often cited (i.e. raising valuables, sandbagging and evacuation). However, the limitations of all three options were appreciated and there was some discussion about whether those who cited evacuation as an option would in fact leave their home during an event. Evidence was presented to suggest that large-scale spontaneous evacuation would be unlikely to occur.

This chapter has covered a great deal of ground. The range of perceptions of multifarious risk factors have been reviewed and described, and some of their implications detailed. These findings have effectively achieved the project's objective two:

> **Objective 2a:** To ascertain and describe the range of individuals' perceptions of, and responses to, coastal flood risk
>
> **Objective 2b:** To describe the range of influences which have stimulated, shaped and developed these perceptions and responses

The next chapter will now revisit these issues, but from the perspective of resilience in the face of potential future flooding. The individuals' perceptions of what might constitute effective household resilience-building will be explored, as will their perceptions of their

own individual capacities, and those of the FRM institutions, to create a potentially more resilient community.

8 Community Flood Resilience

8.1 Introduction

Two approaches to analysis have now been employed in this thesis. In Chapter 6, quantitative methods were used to provide evidence of the sample populations' flood vulnerability, along with their reported social interactions and social norms – networking and norms being signifiers of inhered social capital (Chapter 3). Through more qualitative analysis, Chapter 7 then investigated individual and social perceptions of flood risk, of flood awareness and of self-protective preparedness. This chapter will draw on both these analyses, as resilience building becomes the central theme of the investigation. Perceptions will be further explored, but from this resilience, rather than response, perspective. Also, the implications of the range of perceptions, knowledges and expectations that have been revealed will be discussed. Analysis in this chapter will be focused, therefore, on achieving the third project objective:

> ***Objective 3:*** To analyse how social networks inform risk perceptions and influence flood resilience in coastal communities

The chapter is split into three sections; the first commences by detailing an exploration of the respondents' perceptions of how they might improve the resilience of their **households** against a hypothetical future flood. The second section will then, initially, explore the range of suggestions offered when the respondents were asked how their **communities** might increase their resilience to the same future event. From this, a discussion of social networking emerges, which focuses on two ways in which networks might operate to increase resilience, through the network linking and network bridging behaviour of local champions. Having explored the social aspects of resilience building, the final section then investigates how the FRM institutions' responsibilities for risk

management are perceived by the publics, and how 'civic-expert' trust relations influence individuals' perceptions of, both, their household's and their communities' resilience potential. Finally the chapter will be summarised, in order to inform the discussion in Chapter 9, which draws the analyses together in order to draw conclusions and make recommendations.

8.2 Building household resilience

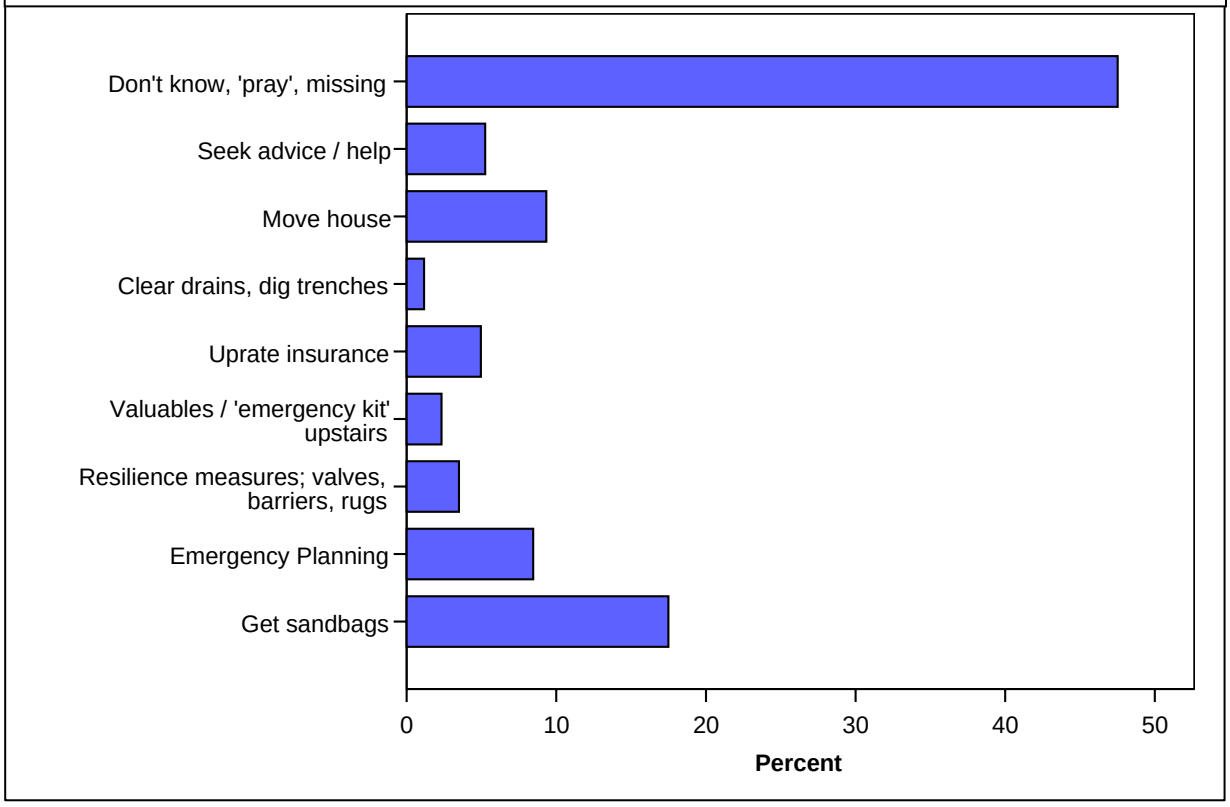
This section explores the respondents' perceptions of how they might increase their households' resilience to a flood predicted to occur during the 'next winter' (Q.11a).

8.2.1 Survey results

When considering possible improvements that could enhance the resilience of their own household to a future event, 47.5% offered either no suggestion or a fatalistic response such as "*pray*" (Figure 8.1). The most-cited potentially positive action was the acquisition of sandbags (17.5%), with the installation of resilience measures (e.g. airbrick covers) being mentioned by 3%. These results, tend to suggest that there is a very limited understanding of the potential benefits of household-scale structural options to reduce losses, such as raising electrics or purchasing kite-marked protection products (ODPM, 2003). This does, however, raise an important issue. The installation of many of these structural measures can involve the investment of significant amounts of capital (Arnell, 2006) and it has been suggested that this financial factor alone has considerable power in influencing perceptions of the practicality and/or the feasibility of employing such measures (Paton *et al.*, 2008). This is a factor that could be particularly pertinent in this case, considering the relatively deprived status of these sample populations (see also, discussion in Section 7.5.2.2). This exact point was elucidated well by one discussant, who had already revealed herself as being, both, extremely hazard aware and prepared:

MrF_103: "I can't afford speculatively to rewire my house so that the wiring is at a height above … where the flood came to in 1977. I cannot afford speculatively to put in sort of plasterwork that's needed because those sort of jobs are very expensive and we're only on a modest income, you know, by the terms of a lot of people in this area we're reasonably well off but still, we have got 5 children at home, we've both got student loans to pay back. My husband and I are mature students; we can't afford the sort of investment in the house."

Figure 8.1: Household resilience. Measures suggested as preparation for future flood



Structural options were not, however, the only alternative mentioned at the household scale. Other recognised good-practice measures, such as emergency planning (8%) and keeping valuables and/or an emergency kit upstairs permanently (2%), where also suggested (E.A., 2008). Perhaps surprisingly, 9% of respondents indicated that if they were aware that they were going to be flooded in the future then they would move house.

Whilst this particular response may have been offered with some sense of ironic humour, it could also be said to indicate a limited appreciation of residual flood effects and the fact that there is **always** the possibility that a flood 'the next winter' might overwhelm structural defences.

One response that has not been discussed in detail yet, is insurance. Only 5% of responses to this particular item suggested that the upgrading of household insurance was an achievable action. However, insurance is regarded as a principal flood-resilience measure (Clark, 1998; Pelling, 2003). For this reason, the next section will take a closer look at, both, this population's current usage of this measure and their perceptions of how their access to this commercialised form of loss-sharing may change in the future.

8.2.1.1 Insurance as a household scale response

Numerous references were made, in the survey and during the group discussions, to the importance of having an insurance policy to guard against the impacts of extremely low-probability hazards. The idea of not having insurance was, indeed, considered to be *"crazy*". However, only 60% of respondents were able to indicate with certainty, that they were currently protected by such a policy. This is considerably lower than the 90% or 75% estimated to be covered by flood-risk inclusive buildings and contents insurance, respectively, at the national scale (ABI, 2007). Whilst others may have been covered, but were not motivated enough by the survey question to check, it is also possible that some in the 25% 'unsure' group, were influenced by a social-desirability bias (Oppenheim, 2004). This bias dictates that individuals would find it hard to admit that they had not implemented, something that could be considered to be a sensible loss-sharing measure for someone residing on a floodplain. In either case, the fact that ~40% were either unsure of their policy conditions, or lacked insurance completely, suggests

that these individuals could be particularly vulnerable to long-term financial effects, should a flood occur (Fordham & Ketteridge, 1995; Thrush *et al.*, 2005).

Looking at the data, two weak relationships that accorded with the literature were identified as existing at the time of the survey (χ^*). Those over the age of 45 years were significantly more likely to have insurance than those who were younger (Andrew, 2006), and tenants were less likely to have insurance cover than were owner-occupiers (Burby *et al.*, 2003). Members of either of these groups, if uninsured, can be vulnerable to flood losses. For example, due to high rental-sector turnover rates, tenants may be unaware of warnings or may be limited in their capacity to implement protective actions (*ibid.*). Also, younger households have been found to suffer greater long-term effects than might be expected. This is due the tendency for members of these households to be under greater stress from work or childcare commitments, this in turn, strains their ability to allocate time and energy to their own household's recovery (Carroll *et al.*, 2006).

In the discussions, one interesting point was raised in relation to the legal protection of tenants. It was suggested that whilst it is recommended practice (Pitt, 2008), it would be impossible to legislate that every household should prepare an emergency flood-plan. However, this was not regarded as being necessarily the case when participants considered regulated housing providers. Fire regulations were regarded here as being a good example of the way that people can be compelled to inform tenants of safety precautions (DCLG, 2008)[1]. It was suggested that landlords could be similarly

[1] The Regulatory Reform (Fire Safety) Order 2005 is the legislation that covers landlords' fire safety responsibilities but it only relates to common areas of blocks of flats or houses in multiple occupation. The Order stipulates that a 'responsible person' carries out a fire-risk assessment and "*implements appropriate fire safety measures to minimise the risk to life from fire*". Premises are liable to inspection by the Fire & Rescue Authorities to ensure that adequate fire-safety measures are in place. However, the term 'adequate' is open to subjective interpretation and requirements will vary between enforcement authorities (DCLG, 2008a).

compelled to advise their tenants if they were exposed to a flood hazard and if so, how they could act to reduce their vulnerability (Burby *et al.*, 2003)[2];

> ClM2_01: "But that's mainly down for landlords, people might be coming into the area not all that aware that they're in a flood area you know, perhaps it should be a notice you know, '*In Case of Fire'* action should be '*In Case of Flood'*, something like that?"

Returning to insurance, whilst some respondents felt concerned that the problem of insurance affordability and availability was perceived to be increasing, others provided examples of insurance premiums being unaffected by hazard exposure:

> Surv_MbM-105: "I live some six to seven hundred yards from the sea. I don't know at what 'level' we are on. However, my insurance [company] have no problem. My house and contents premium is the same as it was 120 miles inland."

Despite such cases, however, discussion as to how the insurance industry could help to prolong the viability of exposed communities did reveal a degree of tension. There was frustration at the thought that these communities were being taken advantage of, in that, whilst they had not been flooded for years, on the whole, their annual premiums were rising, or their policies were becoming harder to renew (see also Section 7.3.2.1).

Some equity concerns were also raised, particularly in relation to the potential for having underwritten clauses or laws imposed in the future, whereby the retro-fitting of resilience measures might be made compulsory before insurance would be provided. These concerns surrounded the potentially regressive nature of such clauses and the fact that, without some form of means-tested grant system, the most vulnerable could be forced to go without an insurance safety net (Treby *et al.*, 2006). Such clauses were also, however, regarded as presenting an unfair burden on **all** floodplain dwellers, particularly

[2] *NB.* This idea was considered by Pitt (2008), but it was found that no legal vehicle existed, at present, under which such an obligation could be implemented. Pitt recommended that a voluntary code of practice should be introduced by the letting industry.

those who had not experienced a recent flood. It could be suggested, however, that this is not a strong argument. It fails to acknowledge that the insurance industry in the UK is a market-based commercial enterprise and that in order to remain competitive it is inevitably subject to change:

> The quality of the insurance system is not measured in terms of how to handle routine situations or being economically efficient, but mainly in terms of its ability to adapt to new situations. (Huber, 2004: p.1)

The iterative risk calculations undertaken by the industry have shown that the financial losses, which it is required to compensate after extreme events, can be significantly reduced if clients implement resiliency measures (ABI, 2003; ABI, 2006). To make such actions mandatory could, therefore, be regarded as an example of a sensible, adaptive, business practice (Treby *et al.*, 2006). Yet, the fact that the probabilistically-calculated 'event risk' is perceived as being very low by many floodplain dwellers, means that such clauses would invariably cause consternation; as policyholders would feel reluctant to pay for measures they see as bearing unnecessary expense. This is regardless of the fact that the outcome risks of an extreme flood, at household scale, could be formidable (Sarewitz *et al.*, 2003).

8.2.2 Summary: household resilience-building

In considering household resilience-building, 65% of respondents suggested that the acquisition of sandbags was the only action they could think of, or suggested no action at all. This illustrates an apparent dilemma. This population has indicated that it may be relatively effective in terms of initiating common-sense responsive actions (Section 7.5.2.5). Yet, there are severe limitations as to what householders consider they can do, proactively, to prepare for a hypothetical – yet possible – future flood.

Even discussions in relation to the principal flood-resilience measure, insurance, invoked a degree of frustration. There was a appreciation of the truth in the argument, that householders do have some responsibility for reducing their insurer's exposure, by managing their own vulnerability (ABI, 2008). However, it was apparent that the long-term lack of local sea-flooding (decades), coupled with the structural defence work that had been undertaken in the interim, appeared to have allowed the pragmatic perspective to develop into an optimistic bias. This seemed to allow individuals to perceive themselves as a much lower insurance risk than other people; such as the residents of Hull and the Severn Valley. That the media images of these other communities' plight during the preceding months' flooding was still clear in their minds apparently only added to this bias. For those images did, indeed, allow an interpretation to be made that floods happened to other exposed people, and not to them (Slovic *et al.*, 1982):

> MrM2_02: "They were in a flood area and a lot of them couldn't get insurance anyway before the floods, so they all know it can flood and must flood pretty regular. You know, when they were interviewing people on the television, I mean they were all saying "Ah look at all this and all this" and yet some of them were [saying] "Well we get it every year, we expect it", you know … but it did go further than it usually does."

Investigating the resilience of households situated in coastal towns is interesting, in that it illuminates householders' perceptions of self-protective efficacy (Grothmann & Reusswig, 2006). However, this scale of resilience is only part of the story. All three of the case-study towns have long and eventful flood histories. That all of them have persisted and grown in these flood-exposed places is, therefore, testament to a complex mix of human ingenuity and political decision-making. This broader context predicates that no one household can be considered in isolation, from the decisions made in relation to flood-risk management on their behalf. The next section, therefore, investigates the perceptions of resilience-building potential at town resolution. How do

individuals weigh the respective roles of, the FRM institutions, the greater community and themselves, as members of that community, in reducing individual and societal risks to a tolerable level (Section 2.1.3), and in building cross-scale resilience to extant threats (Vogt *et al.*, 2008)?

8.3 Building Community resilience

This chapter section starts with the exploration of survey responses to the question item (11b), which asked respondents what measures they considered could be implemented, by the 'town', in order to mitigate the societal risks[3] of a future flood. Suggested structural and non-structural responses will be discussed as will – through the concept of 'local champions' – the potential role of social networking in community resilience-building. The next chapter section will then identify any particular barriers and gateways to increasing community resilience that emerge through the analysis, but also through the interpretation of the policy and political influences, which have been introduced at the community level by the currently operating FRM institutions.

8.3.1 Survey results

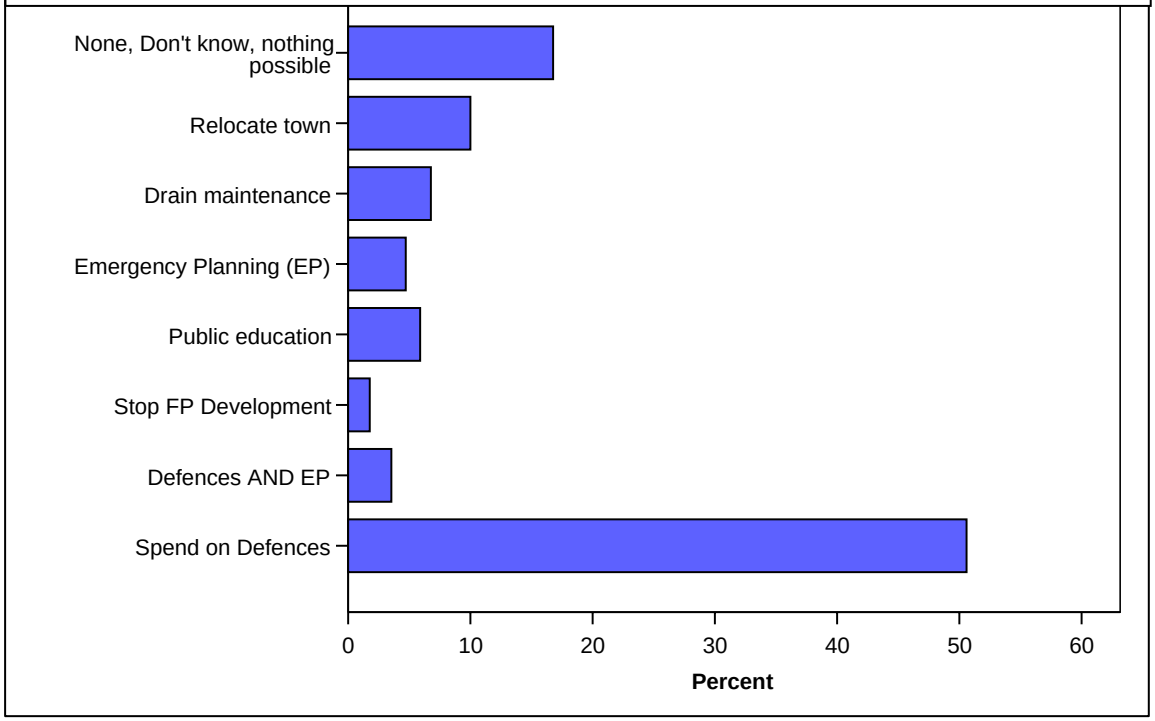
As with other questions in this survey, item 11b was open and responses to it took the form of unprompted suggestions, which were coded in order to facilitate analysis. During the coding process, two categories of suggested risk-mitigation measures emerged; structural and non-structural.

[3] Societal risk is defined as "the relationship between frequency and the number of people suffering from a specified level of harm in a given population from the realisation of specified hazards" (Jonkman *et al.*, 2003: p.6). In clarification, the 'specified level of harm' considered by this survey's respondents would have likely been more subjective than 'death', which is the usual level considered in societal risk calculations.

8.3.1.1 Structural measures

In considering potential options to increase community resilience to future flood hazards, 53% suggested that the improvement of structural sea-defences and drainage infrastructure would be the most appropriate actions to implement (Figure 8.2). This was despite the fact that 67% of these same individuals were later to express their satisfaction with the existing defences' standard of protection.

Figure 8.2: Town Resilience: Measures suggested as preparation for future flood



The large-scale of structural measures, and the huge financial investment needed to maintain them, dictates that they are managed and maintained by the formal FRM organisations. Discussions about these measures, therefore, raised important issues regarding responsibility and 'civic – expert' trust relations. These issues will be

discussed in more detail in Section 8.4. For now, however, the discussion will move on to non-structural measures.

8.3.1.2 Non-structural measures

The most popular non-structural measures cited were that public education, emergency planning and vulnerability mapping should be increased, and that improvements could be made to flood warning systems. Yet, in total, only 14% suggested one of more of these options. All these measures are in fact integral to the development of cross-scale flood resilience (HMG, 2005). Therefore, investment in them is currently ongoing under the auspices of legislation, such as The Civil Contingencies Act (2004) and The Floods Directive (EC, 2006). Recent events have, however, shown that there is still some way to go before the full potential of these measures will be realised (Pitt, 2008). Whilst little clarification was forthcoming during the discussions in relation to the issues of mapping and community planning, the efficacy of public education – a measure wherein the actual at-risk public is integral to the efforts undertaken on its behalf – did draw some insights.

8.3.1.2.1 Public education as a community scale response

In essence, the difficulty in raising awareness (let alone promoting preparedness), through public education was appreciated by group participants and key informants alike. For example, two particular quotations reflect two perspectives on the use of a local authority newsletter as a source of risk information:

> Key_Mb01: "[We] do have what's called '*County News'* … which is a Lincolnshire County Council newspaper which comes out on a regular basis, and we did devote a double page as to what you should do in the event of a flood and told everybody everything, and that goes to every household in the county. Now, there again, people get the county council magazine [*mimics throwing rubbish in the bin*] ... So we can't guarantee that they actually read what comes out but we do try and put it out."

This first statement suggests that FRM staff can have a pragmatic perception of the publics' engagement with regularly employed formal awareness-raising efforts. In effect, the staff members recognise the need for public risk communication as axiomatic, but they also understand that information dissemination of this type can have a very limited impact (McKenzie-Mohr, 2000; Paton *et al.*, 2008). However, during the discussions, the same example was used by a participant, in order to express some sympathy in relation to this difficulty in generating public engagement with putative risks:

> MbM1_04: "As far as emergency packs are concerned … the last copy of *County News* had a two page pull out with … the list in, didn't it? Spare batteries, battery operated radio, flasks of water, a tin opener of course, 'Three Men in a Boat' you know, and all that sort of thing. So they've done it but once they've done that they can't be expected to do anymore. They can't go around every house"

This participant acknowledged that information had been provided, but also appreciated that householders need to take the important extra step themselves, by actually reading and acting upon the information they receive.

This was not the only aspect of education that was discussed, however. The role of schoolchildren in promoting hazard awareness within the bonded social networks in the home was raised in relation to school-based education campaigns. Here, the effectiveness of hazard education in teaching children important skills, which they subsequently employ to help others, was acknowledged[4]. Examples were given of the benefits accrued by children, during fire-safety lessons.

> MrF2_01: "…the children learnt obviously how to set out a plan if you got a fire in your house, what would be the safest exit point. But some of it was obviously, completely hypothetical"
>
> *Interviewer: In what respect?*

[4] Consider the schoolgirl Tilly Smith whose hazard knowledge, learned in a school geography lesson, saved many lives during the Boxing Day 2004 tsunami (Briceño, 2007)

> MrF2_01: “Like if you had a fire by your front door where would you get out? And my little boy at the time was only 9 and he just said “Well, I would get out of the nearest exit or a window or I would tell my mum” you know?”

Adult-knowledge vs. child-knowledge legitimacy issues were, however, raised in relation to the nature of children’s capacity to influence their parents’ behaviour; i.e. whether children actually have the capacity to act as household ‘champions’ in respect to environmental and safety issues (Section 8.3.2.1). Some aspects of fire safety, recycling, dog fouling and ‘Green Cross’ campaigns were regarded as having been positive examples of such influence. However, placing too much expectation on the influence of school-based education programmes was also suggested as being potentially problematic. For example, it was agreed that a child asking a parent to leave her/his key in the door at night, as a fire-safety precaution, might have that request adopted – it is, afterall, a costless and common-sense action, which a proud parent could happily implement to satisfy a seemingly enthusiastic child (Ronan & Johnston, 2005). However, the thought that children could give advice about flood-mitigation measures, other than learning, themselves, to raise valuables and to block water-ingress points with towels, was seen as unlikely to be as effective:

> ClF2_03: “I can’t imagine my kids coming home and telling me that I need to do this that and the other to the house. Although, I agree it is a way of feeding information into a home, I wouldn’t have said that that has got as much weight [as media-based awareness campaigns]”

In relation to inducing interest in these, more major, resilience measures it has been suggested that the traditional parent/child role state is more difficult to transcend through only infrequent education interventions (Section 2.2.1.6). Parents have a natural inclination to ‘know what is best’ for their child and, therefore, may be ambivalent toward discrepancies between what they ‘know’ about a particular hazard and what their child is telling them about it. Without further incitement, the strength of this parental-role effect,

therefore, leads to the maintenance of the *status quo* i.e. the parent disregards the child's information. Yet if maintained, the discrepancy between what the parent 'knows' and what the child is suggesting, can accentuate perceptions that the *status quo* has disadvantages and that there may be advantages in considering the child's suggested changes (e.g. if to change became perceived as a means to make the child safer; a fundamental concern of most parents). This is an important step toward building optimism that change is both good and achievable, and toward building intentions and commitment to change (Ronan & Johnston, 2005). Such a process is only, however, achievable through prolonged education campaigns that can normalise these motivating "change talk" discussions, between those being educated and those with the resources to actually implement the changes. It is suggested, however, that such change talk would be further encouraged if public debates about the issue were to run concurrently with the education programmes; through the media, through '*County News'* type publications and as intrinsic to the public aspects of local planning and community sustainability deliberations and decisions (*ibid.*).

Taking the education perspective, it is enlightening that one group criticised the fact that water-safety and flood-related material were not taught effectively in schools. They pointed out that these were seaside communities and, therefore, they felt the need to teach all types of water safety to those of a young age to be self-evident; yet it was apparently not part of the school curriculum. Another participant, however, stressed the difficulty in drafting public-safety initiatives into an already crammed curriculum, as such subjects would currently need to have some form of assessment criteria to justify their inclusion.

8.3.2 Summary: community resilience-building

The survey responses in relation to community resilience-building have now been introduced. It has been found that the majority of the population considers that structural responses constitute the most effective means to mitigate future risk, regardless that many of these same individuals express satisfaction with the current protection standard of their defences. A minority of the population appreciate that non-structural measures, such as emergency planning and vulnerability mapping would be important contributions to community safety. In addition to these findings, a closer investigation has been conducted into the perceived limits and opportunities of education as a non-structural resilience-building measure. It has been suggested that the most effective way to build resilience through education is by using multiple approaches to effect the normalisation of risk-related thinking and discussion throughout the population. Having described these findings and suggestions the discussion will now move on to investigate in a more subjective fashion whether other forms of social networking and social capital were found to have any influence in community resilience-building.

8.4 Social networks and community resilience-building

Chapter 6 introduced quantitative evidence that norms of trust and reciprocity were inhered within the sample populations. There was also evidence that indicated social networking occurred within the population. In this section these elements of social capital will be used to investigate whether the actions of particular community members have the power to influence adaptation and resilience building by bridging and linking across the wider community (Section 3.2).

The evidence of trust, reciprocity and social networking, described in Section 6.5 suggested that the social capital evident in these populations was predominantly bonding

and bridging in nature, but a smaller number of respondents did report linking behaviour. This evidence was used to suggest that social capital could act as a foundation for collective action during a hazard event. However, in the focus-group discussions the roles of social trust, reciprocity and network relations appeared fairly peripheral within conversations about resilience building. Without doubt there was evidence of strong social capital at a street-level:

> MrM2_02: "We're the old way you know, my neighbours around, close, been there for as long as I [have] so obviously we go in one another's houses … at Christmas they'll be over /
>
> MrF2_01: / yeah that's how it used to be didn't it? /
>
> MrM2_02: / yeah but we've tried to maintain that and even when the younger ones that have come, you know 4 or 5 years, I mean "I'm Derek" to the kids "and the wife's Auntie Olwen""

However, there were also indications of social disengagement, even at this micro-scale:

> ClF2_02: "Well I was talking to a lady that lives 3 doors away from me and she was asking me where I lived and I said [*points as if toward house and smiles*] so I don't know where you go from there. It's just, to me, I just think that people are quite unfriendly, you know, you try your best to talk to people and say, but they've kind of known each other for years haven't they so I suppose /
>
> ClM2_01: / It's true isn't it yes, yes"

In all the towns an apparent decline in feelings of community, beyond that of simple good neighbourliness, was attributed to such influences as the closing of local shops and, at a slightly broader scale, to the influx of perceived 'outsiders' into large new housing developments in the towns. Issues relating particularly to the migration of the retired into these coastal towns, mentioned in Section 7.2, were also seen as a contributory factor in the social isolation of at least some of these immigrants:

MbM2_03: "The thing is a lot of people come here for a holiday during the summer and think "What a glorious place!" /

[*general agreement*]

MbM2_03: They move here in September and /

MbM2_05: / Come November they want to go /

MbM2_03: / well Yeah, or even come January or February they have gone down to the churchyard.

MbM2_05: That's the case.

MbM2_03: It happens an awful lot."

In relation to sea flooding, no explicit indication was made that social networking or social trust was important in the development of community resilience. However, there was considerable evidence that certain individuals within the population could be regarded as being more resilient than others. This more implicit evidence of resilience **within** the community will now be discussed through the concept of 'local champions'.

8.4.1 'Local Champions'

According to Rogers (2003), the uptake and diffusion of innovative technologies can be effectively achieved through the utilisation of 'early adopters' and 'change agents'. He describes early adopters as individuals, within the community, who would be considered as "*the person to check with*" before someone would consider adopting a new idea, i.e.

> "Because early adopters are not that far ahead of the average individual in innovativeness, they serve as a role model for many other members of a social system." (*ibid.:* p.283)

Whereas:

> "Change agents provide a communication link between a resource system with some kind of expertise and a client [adoptive] system. One main role of a

> change agent is to facilitate the flow of innovations from a change agency to an audience of clients [adopters]" (*ibid.*: p.368)

In effect, Rogers suggests that the diffusion of innovations into a community is best achieved by change agents, who actively seek out early-adopters to test and implement the promoted innovation. Once satisfied, the adopters then recommend the innovation to others in the community, either personally, or simply as a function of their role-model status. Early adopters, therefore, act as the 'local champions' of new innovation. It is for this reason that Tapsell *et al.* (2005) recommend that change agents (e.g. Environment Agency staff) identify and use early adopters to aid the diffusion of any flood-warning technologies.

8.4.2 Local Champions in linking networks

From a social capital perspective, change agents could be considered as marginal or boundary figures who are linked across two worlds (that of the formal institutions and that of the social), and early-adopters as both linked and bridged (Section 3.2). Thinking about hierarchically-linking communication ties specifically, it was revealed in Section 7.3.2 that only 6.6% of the population reported that they had spoken, formally, about local flood-risk during the twelve months preceding the survey. It was also suggested that, whilst some of these conversations may have been focused on ameliorating concerns about risk, there was also the other possibility that conversations may have been fuelled by individuals' perceptions that risk was being over-hyped by the FRM agencies. Only one focus-group participant indicated in the survey that he had spoken formally about flood risk during this time period; despite the fact that during the discussions it transpired that more participants had actually done so (Section 7.3.2.1). Therefore, if change agents are viewed, from an FRM perspective, as officers of the

FRM organisations, and 'change aids'[5] as being those associated with them (e.g. volunteer flood wardens), then this evidence appears to suggest that very few individuals have **knowingly** come into contact with anyone who could be so categorised. However, despite this apparent lack of interaction, between the formal FRM actors and the community, it appeared that such interaction would be appreciated by some:

> MbF1_03: "…we don't have any specified person as a flood coordinator. If we had such a people, as daft as it sounds, people would sit and take notice for a few minutes but because we don't have a flood coordinator to educate people about what happens when a flood occurs whether it be tidal or whether it be torrential rain, or 'Act of God', people fall to pieces. They need someone to explain to them what to do … and they need to have a figurehead to relate to, otherwise everything goes out of the window."

This group indicated their support for a locally-based flood coordinator. Also, in accordance with this call, Neighbourhood Watch was cited in several other discussions as being a model that could be used in the development of some sort of street-scale flood awareness and warning system. The extension of Neighbourhood Watch systems, to cover flood issues, has also been encouraged by Pitt (2008: p.331) and others (Thrush *et al.*, 2005). However, whilst such systems can be effective in areas that suffer regular flooding (Parker & Handmer, 1998; Wenger & Weller, 1973), the groups suggested that their use in areas with low-probability hazards could be more problematic; specifically in relation to recruitment and retention of volunteers:

> Key_Mb01: "… the flood warden scheme, or any flood warden scheme is dependent upon the local community wanting to get involved, so whilst we've got flood wardens in Mablethorpe and we've get flood wardens in Sandilands … and Sutton-on-Sea we wouldn't say that it's comprehensive cover, because it's just local communities. Some are interested; it's a bit like your Neighbourhood Watch really, just an

[5] For the purpose of this project "change aids" are considered to be people who are formally tied to the 'official' change agents, rather than the local champions who, whilst displaying some of the characteristics of 'change aids' (see Tapsell *et al.*, 2005: p.33), actually remain autonomous from the formal organisations and institutions.

> extension of a Neighbourhood Watch. So some people are interested so they volunteer to do the job for their local community and other people aren't really that bothered so those areas aren't covered."

And:

> ClM1_02: "… getting back to this local group as you say, I don't think you'd be able to hold the people together long enough to do it, you get the odd one or two, you know, that would really do it, but it's like trying to form a committee at a club, you can't do it.
>
> ClM1_01: "I think generally it would be extremely difficult because [sea flooding is] not perceived as a real threat in the area. Should it be perceived as a real threat then maybe you'd have more of a chance to hold the group together"

Taken together, these perspectives throw up interesting issues. Residents of Mablethorpe stated that they were not aware of any locally-based representation of the FRM organisations, yet flood wardens are already present within parts of that community. This problem of segregation, between those areas of the community with wardens and those without, was acknowledged by the key informant for that area. In addition to this, Cleveleys residents identified the benefits of wardens, but suggested that it would be extremely difficult to maintain any form of street-level warden system in their area, due to the overriding perception that flooding represented a low risk.

What could be suggested as lacking from this picture is the 'coordinator', mentioned by the Mablethorpe participant, who is most importantly locally based, yet who operates as a change agent or change aid. Such a person would need overarching responsibility to act as a social amplification station (Kasperson *et al.*, 1988),[6] for the diffusion through the wider community of (1) generalised and **locally relevant** flood-risk information, and

[6] The term 'amplification station' is used within the Social Amplification of Risk Framework (Kasperson *et al.*, 1988) to describe any human or technological 'hub' in a communication network which generates and transmits information via communications channels (e.g. media, letters, telephones, direct conversations). Amplification stations have the capacity to accept, interpret, process, decode, filter, attach value to or ignore messages or aspects of messages which pass through them.

(2) any **locally relevant** flood-warnings, which may be issued within short time windows. Whilst volunteer wardens do perform these duties to an extent (and are generally highly regarded for doing so, Twigger-Ross *et al.*, 2008; Thrush *et al.*, 2005), the evidence here suggests that their street-level interactions are insufficient at a community-scale and that a more highly-linked individual (e.g. a Parish Councillor; volunteer coordinator) might be better able to undertake this oversight role. As has been pointed out:

> "The "local and personal face" is seen as an important component of [any flood risk] communication strategy." Shaw *et al.* (2005: p.*v*)

Having such a locally-based individual, would also provide two further benefits (1) s/he would be a useful information hub when it came to updating the Community Risk Register and the local 'list of lists', which contains details of the most vulnerable community members (Cabinet Office, 2008), and (2), such a media-friendly 'face' or 'voice' would also, to an extent, circumvent many of the health and safety considerations that are perceived to severely restrict the recruitment, management and deployment of formalised warden systems (Thrush *et al.*, 2005).

Having discussed the role of local champions as community-linking assets, the discussion will now explore their influence in the more lateral dissemination of resilience good-practice and advice, across bridging networks.

8.4.3 Local Champions in bridging networks

In Section 7.3.2.2 it was revealed that 53% of the population had spoken about local flooding issues amongst networks of friends and neighbours. This means that these respondents were eight times more likely to discuss flooding within bridged networks than within linked networks. Furthermore, in addition to the references to flood coordinators and warden systems made within discussion groups, a more implicit

message also emerged. This was that some members of the community were already aware of and engaged with flood-risk issues, to the extent that they had contingency plans in place, or they had implemented other measures to reduce their perceived risks (Section 7.5.2.2). From a resilience perspective, these factors suggest that the participating individuals in particular, many of whom fell into the 'Super' categories of social and civic engagement (see Section 6.5), could be regarded as true local champions. Whether these individuals' have any resilience-building influence within their informal social networks is, however, harder to tease from the data.

It has already been pointed out that informal discussions are reported to have less of an influence in changing individuals' flood-risk perceptions than does the media (Figure 7.5). It was also revealed that informal discussions can have a similar cognitive risk-accentuating effect, but also a larger risk-attenuating effect than the media (Figures 7.2 and 7.6). Importantly, only 1.2% of the entire population indicated that informal discussions had led them to take physical action during the previous 12 months to reduce their perceived risk level; a very small apparent influence.

It was also apparent that protective actions were generally reported to have been implemented by those who had experience of groundwater flooding and not, generally, by others (Section 7.3.3.1). Furthermore, when asked whether they thought such visible protective actions (e.g. fitting sump-pumps, fitting airbrick covers and collecting sandbags) influenced others, the response was generally negative:

> *Interviewer: "Do your neighbours, do people you know, do people in the street see what you're doing with that in particular and do they take notice of you?*
>
> MbM1_01: No.
>
> MbF1_03: No.

MbM1_01: No. they walk by. Oh you're doing that again, they walk by.

MbM1_02: Or you get a gob full of abuse.

MbF1_03: Ostrich syndrome.

MbM1_01: They walk by and they say, "Having a clear out again?" Some silly joke, you know, but they don't do nothing. Well I don't think I've ever explained it to somebody what it is that I'm doing."

When speaking about flooding it became clear that even within these particular communities, there were 'insiders' and 'outsiders', i.e. there were those who lived with and engaged with flood effects, and those who lived without (Harries & Borrows, 2007; Tapsell & Tunstall, 2008). This resulted in an individualisation of perceptions and actions, whereby even direct neighbours were sometimes perceived as being too ambivalent to appreciate the 'real' risks that these champions had responded to:

MbM2_04: "I live in a bungalow and all 6 bungalows in the Close were I live … there's only 2 of us in that Close that bothered to get the sandbags which the council gave away. So that just shows you their attitude … "It's not going to happen to me!""

In some respects, the ambivalence of these others was rationalised as being due to the competing pressures of their 'busy lives'. However, acknowledging this ambivalence did not stop the champions from expressing their feelings of concern about and their perceptions of responsibility for, the safety and welfare of these 'others', whom they regarded as being more vulnerable than themselves. The champions, in particular, cited these others' lack of risk awareness as being a main element of their vulnerability, but they also cited the influence of the FRM arrangements operating in the towns, which they perceived to be in some particular respects, inadequate:

Interviewer: Is it a self protective cynicism or is it directed at… Is it your protection, the standard of your protection that you're cynical about or the town in general?

MbM2_05: "The town in general /

MbF2_01: / yeah /

MbM2_05: / and not particularly mine because I shan't be here. One more heart attack and I shan't be here. So it's my grandson that lives with me who's only 11 at the moment and my partner who's going to be there, and you, and you and you, Joe Bloggs up the road. They all want looking after, even if they're not prepared to do it for themselves /

MbM2_04: / Oh yes, yes. /

MbM2_05: / they all want looking after."

8.4.4 Summary: Social capital as a factor in community FRM

This section has supplemented the quantitative results of Chapter 6, which concluded that social capital was present within the sample populations. Analysis of more qualitative aspects of the data has revealed that merely having social capital in a community does not mean that it is readily instantiated into any form of hazard resilience. More likely it is something that, from this project's low-probability hazard perspective, would only likely be exercised during and after a hazard event (Dynes, 2002):

ClF2_03: "I think you probably would see in such unusual [flood] situation, I think the community in a street would eventually pull together. I think it would just take time, you know the initial reaction is to protect your own, then when it becomes to such an extreme, I think you would see the community opening up, within an immediate vicinity. Again, you'd probably widen your, we'd look after or we'd sort of work with our immediate neighbours, then I think you'd see it widening within the streets."

It has also been shown that local hazard-champions do exist within these communities, but that it appears the effectiveness of their 'early adopter', role-model status, is limited to some degree by the ambivalence of those living around them. None of the participants who exhibited the traits of local champions reported having been directly

influenced in their behaviour by any formal FRM change agent. More often, their actions could be regarded as resulting from their own experience of hazards, or their own understanding of local history or environmental effects (Section 7.3.3). However, these champions appreciated the importance of change agents and craved that some form of locally accountable coordinator be put visibly in place to oversee their town's flood-risk issues. Attempting to introduce such an inevitably political appointee would, however, be affected by two other important issues that were raised in relation to these communities' current understandings of the FRM institutions; responsibility and trust.

8.5 Perceptions of participatory flood risk governance

In the earlier sections of this chapter, the discussion revolved around resilience-building at the household and community levels. Also the potential for particular individuals to change the behaviour of the greater community was explored. It appeared that, with caveats, individuals had little perceived effect in building resilience at anything above household scale. There was also an apparent lack of engagement with the risks associated with potential future flood events, or of the measures that could be implemented to reduce these risks; other than very basic responses. This was suggested to be, in part, attributable to ambivalence, but also to the scale of each town's in-situ sea-defence infrastructure. Interestingly, this ambivalence was apparent, despite the fact that a significant percentage of the population considers that future flooding is more likely than not (Section 7.4.2). The next section will investigate and discuss what are perceived to be the FRM organisations' institutionalised responsibilities in managing flood risk as part of 'the community', and how issues of trust between the public and these institutions are reflected in risk perceptions.

8.5.1 Trust in authority and the politics of responsibility

When the responses to the statement "This community takes the risk of flooding seriously" were analysed, a similar differentiation appeared to that which occurred in relation to other flood factors in earlier analyses, i.e. there was a tendency for stronger agreement in Mablethorpe and Cleveleys, than in Morecambe ($p < 0.05$). This result clearly resonates with the responses in relation to how these people prioritised flood issues, relative to other local environmental concerns (Section 7.2). In effect, whilst it is apparent that the Morecambe respondents tend not to perceive that flooding is a problem for them as individuals, they are also more likely to think that this perception pervades across the community; whereas, in the other towns there is a greater perceived positive individual and social acceptance of flood risks.

However, in the context of building the towns' resilience, this was clearly an issue that was considered as something requiring the authority of formalised rules and formal actors (Section 8.3.1.1). That this is the case was clearly exemplified when a discussant cited the Thames Barrier as an example of a situation where a community – in the sense of it being an aggregation of local residents – cannot be expected to protect itself from extreme flood-hazards, without the presence of a powerful institutionalised structure that is capable of coordination and funding:

> MrM2_02: "Blokes in the street can't go "Yeah right, we'll put a barrier up, come on get the old shovels out!""

Taking this view forward, it has been suggested that people with a limited knowledge of certain hazards, have a tendency to trust the organisations they deem to be responsible for managing those hazards, to mitigate the risks to which they are exposed (Siegrist & Cvetkovich, 2000). From a flood-risk perspective, therefore, being able to trust that **someone** is maintaining the standard of sea defences or the drainage infrastructure

(Section 7.4.2), or that **someone** will issue warnings in time (Section 7.5.1), allows individuals to perceive that they are exposing themselves to lesser personal risks (Freudenburg, 1993). It is this trust that could, in effect, be argued to have produced the division of labour that motivates the risk-taking of those who continue to make the floodplain their home. However, if this trust is considered to have been abused, through what might be perceived as recreant behaviour on the part of those responsible organisations, then it is possible that protest will ensue (*ibid.*; Wynne, 1992). This is because the trust extended to formal institutions, has a perlocutionary effect. This is an effect that dictates that trust in authority should be considered as something that is more often granted under conditions of dependency, than in the closure of a mutually beneficial relationship. Therefore, there is a particularly motivating perception of 'wrongness' if those who are 'required' to trust in this way, feel themselves to have been deceived (Szerszynski, 1999: see also, Section 3.1.2).

From this perspective, evidence of participation in sea-defence decision-making was not apparent. Much more, the impression given was that this decision making was something that the FRM agencies were simply trusted to get on with and that, broadly, they were considered to be doing well. Whilst there was some acknowledgement that risks might increase in the future, due to the changing climate and sea-level rise, these future risks were only reckoned by a minority to warrant preparatory non-structural adaptations, 'behind the sea wall' so to speak (Section 7.4.3.2 and Figure 8.2). The broad-scale need to trust the FRM institutions, in their capacity to mitigate sea-flooding, was summed up by a key informant who, as a Councillor, reported the policy position of the locally-elected representatives in Mablethorpe:

> Key_Mb04: "At the moment … the Chief Executive and the Leader of the Council both have the attitude that, you know, **the sea is there, we're not going to let it come in**. We've had hundreds of years of pushing

> it back, pushing it back, pushing it back, we're holding the line. And they've got to have that story or else the town is so fragile, I mean if they suddenly said "We're not going to develop Mablethorpe, we're not going to hold the sea defences, what happens, happens", there are insurance issues around here, it might be worse." (emphasis added)

Despite the public's apparent ambivalence toward direct involvement in sea-defence decisions, there was, however, evidence of some attempts at participation in the governance of chronic surface-water problems:

> MbM1_04: "Drain improvement is a shoddy mess around here frankly. We've had to knock on doors, ring up people, be an absolute pest. Anglian Water are very poor at liaising with anybody, and that's a well known fact. So drain improvement, don't know, can't tell you, we have to nag, nag, nag, nag until we get any sense out of anybody."

One overarching theme of these complaints related to the perceived unaccountability of the operators within the water sector, which resulted from numerous organisations and agencies sharing the responsibility for moving any parcel of water from A to sea. This theme, in essence, reflected a primary concern regarding the UK water sector as a whole, which was formally problematised for investigation following the summer floods of 2007 (Coulthard *et al.*, 2007; Pitt, 2008).

Another trust issue that revealed considerable frustrations, was the ongoing development of the floodplains. The Councils and LPAs were perceived as being committed to the incremental development of all three towns, whilst at the same time being seemingly incapable of encouraging or enforcing sustainable drainage interconnectivity. As a result, new developments were regarded almost unanimously as creating greater flood risks for the wider community:

> MbM1_01: "… the drains, now I get flooded over the back here every time with this heavy rain which is coming more. In the 5 years I've been here it is getting worse. Since I first came, first year fine I think but the

> last 12 months! … I put it down to this building, that building, the medical centre and that building."
>
> [*NB.* the speaker here is referring to the new community centre in which the discussion was taking place and other large new community buildings situated around it]

This perception prevailed, despite the fact that all planning decisions made by the LPAs since 2001 had been required to comply with the provisions of Planning Policy Guidance 25 "Development and Flood Risk" (PPG25), and since December 2006 with the upgraded statutory requirements of its replacement, Planning Policy Statement 25 (PPS 25) [7]

In fact, where there appeared to be a pragmatic or fatalistic consideration of sea-flood risks (Section 7.3.2.2), a 'culture of blame' (Douglas, 1994) had definitely been fomented in regard to the drainage issues. Several discussants indicated that they had personally taken concerns about drainage directly to either the council, to the water operators or to higher authorities. In most cases, however, these actions had only resulted in feelings of personal disenfranchisement, frustration and a diminution of trust in these institutions' capacity, to engage with, or even to acknowledge 'lay' perspectives:

> MbM1_01: "I had no one else to go to [about my garden flooding] so … I went to the Prime Minister to finish, I started with Peter Tapsell [MP] and went further than that. You get a reply "We're looking into it" but that's as far as it goes isn't it?"
>
> MbF1_05: It always comes back to yourself"

Overall, it could be suggested that surface-water flood risks appeared to be regarded as more 'social' in origin (Tapsell & Tunstall, 2008), whereas, sea-flood risks were considered more 'natural'. As a result, greater levels of trust were afforded to the

[7] East Lindsey LPA (Mablethorpe) were in fact cited in the Environment Agency 2006/2007 High Level Target 5 report as being responsible for approving planning applications in contravention of PPS25 planning policy (E.A., 2007d)

Agencies responsible for the management of sea defences – that were perceived to have 'prevented' sea-flooding for so many years –, than to the fragmented drainage institutions (Section 8.4.1). Doubtless, this divergence in perception is partially the result of flood protection standards, wherein, the AEP of drainage infrastructure tends to be 3.3% (1:30) (Coulthard *et al.*, 2007), whereas for sea defences in the towns it stands between 0.5% and 0.33% (Chapter 5). However, when considering the risk perceptions of coastal communities, this dual perspective on flood risks should be acknowledged.

Translating MacKenzies' certainty trough (Figure 2.1), fully into this context, it now becomes possible to more precisely attribute roles to the process of flood-knowledge transference. Figure 8.3 shows two derivations of the trough, constructed through the interpretation of both the literature and of the project participants' perceptions of the process of coastal flood-risk management.

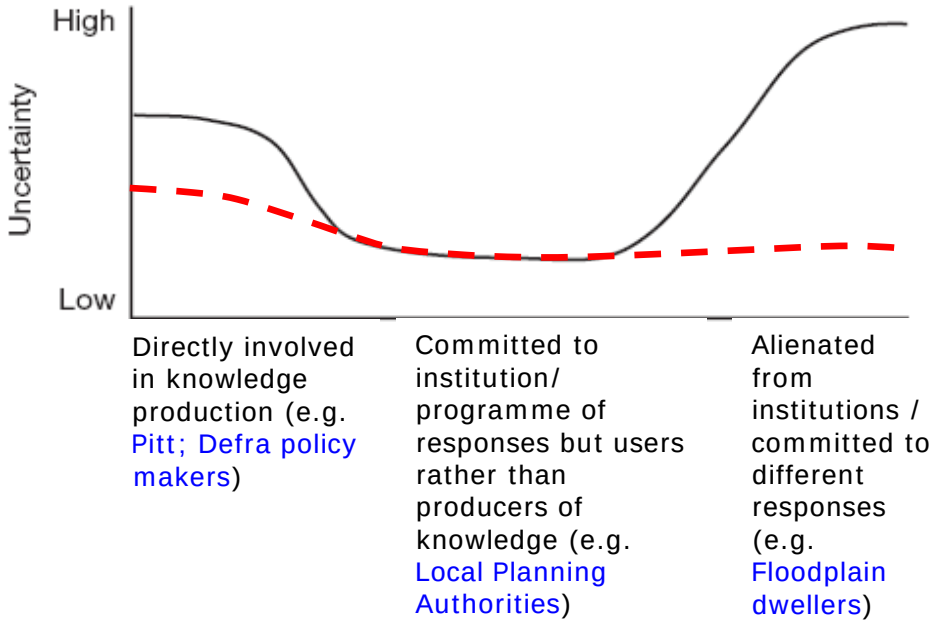


Figure 8.3: MacKenzie's 'certainty trough' concept applied to the social perceptions of flood-risk management in coastal towns.

- Solid line refers to perceptions of surface water flood risks.
- Dashed line refers to perceptions of sea-flood risks.

Original source: MacKenzie (1990: p.372)

In Figure 8.3, the solid line describes the publics' perceptions of uncertainty, as it relates to surface-water flooding. Here the perception is that actors such as Sir Michael Pitt and flood policy-makers such as Defra (i.e. the '*knowledge producers'*), are aware of considerable uncertainty in relation to the prediction of surface-water flood effects, particularly at the local-scale (as has been publicly acknowledged by Coulthard *et al.*, 2007; and Pitt, 2008). When the knowledge moves to the '*program loyalists'* (in this case the LPAs) however, it is apparent that some people perceive that the officers of these institutions justify to themselves that low levels of uncertainty affect this knowledge. The public's perception is that this is what allows the officers to continue to grant planning applications in the towns, without insisting on the implementation of adequate flood mitigation measures. From here the trough is formed, as the knowledge passes to the '*alienated'*. At this final stage the multiple publics, who can witness flooding at its most localised scale and yet, whose 'lay' opinion is rarely sought or considered, perceive the highest uncertainty of all. This in turn can result in feelings of frustration or anxiety as they perceive and/or experience risks accumulating around them. The perceived disenfranchisement that this produces was illustrated particularly well by one discussant:

> MrF1_03: "And so you know, you're saying that is it a bad thing that people don't talk about flooding, well it's not that any of us here, I mean we're not a huge sample of people in Morecambe, it's not that we don't know what the problems are, it's not that we're not well aware of what the difficulties are, it's not that we haven't got ideas about what the solutions might be. The point is that even if you do talk about it nothing gets done, so really you're on a hiding to nothing and it makes you think, well you know, you've got your day to day lives to get on with, what's the point of actually bothering to talk about it, because nobody listens."

Conversely, the dashed line in Figure 8.3 relates to low-probability sea flooding. Here, the uncertainties inherent in the production of knowledge, as it relates to the prediction of extreme events and to the resistance of massive sea defences, is implicit in a lower

perceived initial uncertainty being attributed to the '*producers*' (Muir Wood *et al.*, 2005) [8]. From here the uncertainty is further lowered, as the knowledge passes to local decision-makers; the '*program loyalists'*. This is the point at which decisions such as "*the sea is there, we're not going to let it come in*" are written into local development plans (see above). It is here that the sustainability of coastal communities is balanced against the risks of a low-probability hazard. In effect, local authorities **need** to believe that their communities are defended to the highest standard, in order that investment can be attracted and blight avoided.

From here, however, the trajectory of the knowledge diverges from the path taken for surface-water flooding. In this illustration, the '*alienated*'' publics are attributed a low perception of uncertainty, however – and without wishing to be chastised here for 'blaming the victim' –, it could be suggested that these people are themselves cognitively responsible for maintaining this degree of predictive confidence. It seems that pragmatism and/or fatalism allow these coastal dwellers to regard sea defences as being latently vulnerable and yet, simultaneously, adamantine. Regarding the uncertainties of risk knowledge as being narrowly constrained in this way, also makes it possible for floodplain dwellers to discount the relevance to themselves, of formal risk communications: an extreme sea-flood, in effect, becomes an 'Act of God' for which it is impossible to prepare. Like the loyalists, the publics too have a need to trust these structures and the financial calculations and the political deliberations that are used to justify their construction and maintenance. The "*nuisance*" value (Section 7.3.3.1), or the concerns raised by surface-water hazards, whilst certainly not vaunted, do appear in

[8] Consider Muir-Wood *et al.* (2005) for an example of whether low uncertainty, as perceived by the knowledge producers in relation to storm-surge hazards, equates to low risk. Muir-Wood illustrates that whilst flood probabilities are calculable to an extent and, therefore, uncertainties are relatively low, this does not mean that the residual risks associated with an extreme event are also reduced.

some way tolerable, in the sense that they are acknowledged and regularly engaged by people in these communities. Conversely, few seem to perceive sea flooding as anything more than an unlikely but putative threat, for which responsive reaction is the only practical mitigation measure.

Having now added the analysis of the publics' perceptions of the responsibilities and levels of trust afforded to the FRM organisations and institutions the contents of this chapter will now be drawn together in summary.

8.6 Key Findings: Building Flood Resilience

This chapter has moved on from the investigation of risk perception that was conducted in Chapter 7, to the consideration of resilience building at two scales. Generally, there was a limited appreciation of the range of measures available to increase resilience at these household and community scales. When preparation for a future flood was considered, sandbag acquisition was the most popular suggestion (17.5%). Insurance is regarded as another principal resilience measure. However, only 60% were able to positively affirm that they had flood-risk inclusive policies in place and only 5% suggested that increasing their insurance cover would be a good measure to employ in order to mitigate future risks. Insurance was not, however, without its issues. Respondents were concerned that the effect of the implementation of risk-based pricing by insurance operators' was unfair; as they considered that they were being required to pay higher premiums, whilst they perceived no significant increase in the operators' risk exposure.

From a community perspective, increasing the investment in structural measures proved to be the most popular resilience-building measure. A minority (14%) did, however, suggest options, such as increased emergency planning, as being potentially useful.

Education was acknowledged as being an important and yet troublesome measure to implement. It was suggested that these communities would need to implement self-reinforcing programmes of hazard education that utilise a broad range of techniques and resources (e.g. the media **and** school-based lessons **and** flood wardens). The implementation of such intensive measures was explained as presenting the most likely means to encourage the normalisation of 'change talk' and resilience thinking within these otherwise, predominantly dissonant populations.

The discussion then moved on to consider the roles of 'change agents' and innovation adopting 'local champions' in building cross-scale resilience. It was revealed that, due to the very low interaction with people who might be considered as formal change agents, the role of local champions in these communities could be attributed to their personal hazard experience and exposure, rather than to any formal programme. It was also suggested that these individuals perceived themselves to have a very limited influence over others in their community. This perception is corroborated by the fact that only 1.2% of the population reported that informal discussion had led them to take concrete action to mitigate perceived risks. Overall it was suggested that informal social-networking could be considered as having only peripheral influence in the formulation of household or community resilience. A much more important determinant was exposure to a chronic surface-water flood hazard.

With the evidence suggesting such a limited local-champion effect, the discussion then moved on to explore how the population perceived the role of the formal FRM institutions in creating community resilience. The issues of responsibility and trust were investigated specifically. It was found that the population had a general perception that structural sea-defence was well organised and adequate, whereas, the organisation of surface-water drainage was considered by many to be haphazard and inadequate. It was

posited that surface-water flooding was perceived by these communities as being 'social' in origin, the result of poor risk-management decisions, whereas, sea-flooding was perceived as being more 'natural' and as such, ultimately uncontrollable. This difference in perception was illustrated through a translation of MacKenzie's 'Certainty Trough' (Figure 8.3). This schematic representation of how different knowledge producers and users were perceived by the at-risk publics to regard flood-risk uncertainties provides a useful visualisation of the discovered phenomena that may be useful in understanding the challenges involved in engaging communities with risk-mitigation.

In summary, the findings reported in this chapter have revealed that building resilience to extreme hazards is not map-able along any straightforward or obvious path. Individuals' perceptions of the threats they face, their ability to cope with those threats and their motivations to change in the face of those threats, are steered by complex tangles of cognitive, social and institutional influences. Detailing a small portion of these influences has, importantly, led to the successful achievement of the third objective:

> ***Objective 3:*** To analyse how social networks inform risk perceptions and influence flood resilience in coastal communities

However, it has also revealed the importance of considering two fundamental perspectives on how flood hazards and their associated risks are perceived by coastal populations. All that now remains to do is draw together the findings of this and the other two analysis chapters into cogent conclusions and recommendations. This synthesis will be conducted in Chapter 9.

9 Conclusions

9.1 Introduction

The overall aim of this thesis was to investigate relationships, between risk perception and community resilience to low-probability sea-flood hazards. A major factor in the selection of this aim was that little research had been carried out that looked, with foresight, at these hazards and how communities perceived and prepared for them. Further relevance was provided by three principal factors. Firstly, work conducted by others had revealed that a disproportionate percentage of English households exposed to this type of hazard experience multiple deprivation (Walker *et al.*, 2006). With deprivation regarded as being almost synonymous with vulnerability (Wisner *et al.*, 2004; Birkmann, 2006b), this suggested that the risks affecting this coastal population could also be disproportionate. Secondly, the research was to occur during an institutional shift in relation to how flood hazards are managed. Instead of a tacit dependence on structural defence, a new paradigm now calls for a more inclusive form of flood-risk management. This new system is focused upon the public having a role, in determining their own risks and in acting to reduce them 'where appropriate' (Section 1.5). This temporal conjunction, of an apparently high coastal flood risk being discovered at a time of policy 'revolution', was further influenced by a third factor; the scientific consensus that climate change is introducing new levels of risk to populations exposed to flood hazards of all types.

In order to accomplish the project aim, a series of four objectives were defined. In the next section, the findings made whilst achieving the first three of these objectives will be summarised. Following this, the discussion will then refocus in order to achieve the final objective. This will be done by drawing the findings together, in a way that both identifies

their implications and supports the proposal of particular policy recommendations. The research methods used in the project and particularly its mixed-methods approach will then be discussed. Suggestions for potential future research that might add to these findings will then be made. The thesis will conclude with some final words about what the project has achieved.

9.2 Précis of key findings

The first objective involved the extensive analysis of empirical data. This was necessary, not only to illuminate the complexities inherent in certain aspects of risk-management practice, but importantly, to contextualise the sample population in a way that informed aspects of the intensive analysis to come.

Objective 1a: To identify patterns of flood vulnerability within three exposed coastal populations

Tapsell *et al.*'s (2002) SFVI methodology was used to define the social flood vulnerability 'characteristic' of three coastal populations. All three sites were found to possess concentrations of average to high vulnerability at a household scale (Chapter 5). However, through the application of a small refinement to the SFVI method, one critical discovery was made. By sampling within these ostensibly similar populations, it was found that considerable inter and intra-sample variability can be masked, even with only seven indicator variables being used in an index (Section 6.3). It is true that objective indicators of human frailty (i.e. age, illness) were found to dominate as vulnerability indicators. However, it was also found that other factors have the potential to introduce complexity to any rudimentary understanding of what makes any particular community vulnerable (Section 6.5).

Objective 1b: To identify patterns of social capital (in the form of networks, norms and social trust), within the three coastal populations

Meeting this objective required the quantification of indicators of social trust, reciprocity and informal social networking. It was revealed that there were high levels of socially-supportive 'bridging' activity across all three locations, but a smaller percentage of the population reported involvement in socialising behaviour that linked across hierarchical divides. All this behaviour occurred, however, within localised environments of reportedly high social trust and reciprocity (Section 6.5). In effect, social capital did appear to be inhered within these communities.

Once the populations' social-vulnerability and social-capital related characteristics had been identified the analysis broadened, in order that the more subjective aspects of risk perception and response could be investigated. Objective 2, therefore, required the use of quantitative and qualitative data and techniques.

Objective 2a: To ascertain and describe the range of individuals' perceptions of, and responses to, coastal flood risk

During this phase of the project, flood-risk perceptions were found to vary considerably, both within and between these ostensibly similar populations. Individuals' perceptions of household-risk levels ranged broadly, from concern to dissonance, with the highest numbers of those showing the least concern about the hazard living in one town (Morecambe) (Section 7.2).

There were also a range of perceptions exhibited in relation to flood response, specifically in respect of the warning technologies available in the three towns, and to the actual meaning of any formal warning that might be received (Section 7.5.1). Past experience of flooding and of 'near-miss' alarms, was found to have resulted in the reinforcement of the perception that 'message-confirmation' would be the first response

to any formal warning. Importantly, this project has revealed that this warning-message confirmation tends to be achieved, in these communities, through the observation of environmental cues (a process that is riven with the potential for bias and misinterpretation), rather than discursively through social interaction (Section 7.3.3.2).

Despite the mixed appreciation of warning sources and their reliability, a high percentage of floodplain dwellers did know about common-sense actions that could be implemented to reduce the consequences of flooding (Section 7.5.2). This does not mean, however, that human characteristics and local environmental factors would not reduce the efficacy of such measures 'on the day' (e.g. for an elderly person living in a single-storey structure the raising of valuables above flood level is neither a physically easy nor straightforward operation).

Objective 2b: To identify the range of influences which have stimulated, shaped and developed these perceptions and responses

Overall, it has been found that informal social networks played only a peripheral role in influencing individuals' risk perceptions or in stimulating protective actions. The media, local knowledge and flood experience were all asserted to have greater effects in this regard (Section 7.6).

Also, further to the investigation of social networks, a crucial finding was made during the investigation of how climate change was perceived to be affecting flood risks. The introduction of this factor revealed that risks associated with sea-flooding were perceived as being of much lesser concern than those related to intense precipitation. This is regardless of the fact that the residual risks of extreme storm-surge flooding represent an extant threat, whose consequences could be considerably more severe for the community than those likely to result from all but the most extensive surface-water flooding. In effect, the project qualified a fundamental difference between the

perceptions of risks related to the management of chronic surface-water flood risks, compared to those associated with the management of what were acknowledged as the putative, but more easily discounted, risks of sea-flooding.

The next stage of the investigation involved the exploration of whether these populations used any knowledge or perceptions, derived through their social networks, in order to build resilience. Objective 3 was, therefore, approached from the perspective of mitigating the risks of future hazards.

Objective 3: To analyse how social networks inform risk perceptions and influence flood resilience in coastal communities

The investigation has revealed that most floodplain dwellers perceive little self-protective efficacy and only limited personal responsibility for flood-risk mitigation (Sections 8.2 and 8.3). From a social capital perspective, individuals within the population who **had** implemented resilience measures, or who **had** engaged with agents of the formal FRM authorities in some way, were identified. However, these individuals (who were regarded as exemplifying the traits of 'local champions') appeared to have only a limited influence outside their own bonded social networks (Section 8.4.3). In effect, the hierarchical-linking and network-bridging potential of these individuals appeared to be an attribute of personal value, rather than something that benefitted their wider social networks; at least in any sense that their resilience-building behaviour represented an instantiation of social capital (Fukuyama, 2001).

Critically, however, this perspective does not do satisfactory justice to the **potential** role of these local champions within the community. Interpretive analysis of the focus group

discussions[1], revealed that as well as acting to mitigate risks to their own households, local champions also exhibited altruistic intent toward those in the community whom they perceived to be less prepared and, therefore, more vulnerable than themselves. This is an indication that if a flood were to occur, then there are those in the community who would drive a therapeutic-community response (Section 8.4.4).

In relation to 'change aids', there was little evidence that any hierarchically-linked community-based volunteers, such as flood wardens, had any influence amongst these publics in relation to resilience-building. In addition to this lack of apparent influence, it was also perceived that the infrequency of extreme events meant that the recruitment, retention and motivation of such individuals would be problematic. It was, however, found that some in these communities would appreciate the creation of the position of 'community flood coordinator' at a higher, institutional, level (e.g. a Town Councillor).

Moving on to the consideration of motive; what appeared to have induced these and other **individuals** to implement a range of household-scale resilient responses, was their direct experience of chronic surface-water flooding. Responses to the putative threat of extreme storm-surge flooding, by contrast, were limited to a few non-structural measures (predominantly **insurance**, but also in individual cases actions such as keeping household valuables permanently above an anticipated extreme flood level, or having some form of household emergency plan). Whilst the importance of insurance was considered in Section 8.2.1.1, the piecemeal nature of the implementation of the other household-scale resilience measures has been explained as being related to issues of trust in authority. The significance of this will be discussed further in Section 9.3.

[1] *NB.* Recall that it proved particularly difficult to attract people to participate in the focus groups in the first place (Section 4.5.3) and of those who did attend, several exhibited the traits of either, 'Super' citizenry, or of being 'local champions' (see Section 6.5, Section 8.4.3 and Appendix 6)

The project findings have now been summarised in such a way that some of the challenges, faced by organisations and agencies responsible for delivering effective FRM, have been illuminated from new perspectives. It is proposed that these findings constitute new knowledge. Whilst knowledge creation has always been the aspired 'end-point' of the process that has driven this research project, its creation only really becomes useful if there is also an understanding of its implications at a broader scale. These implications will now be discussed by way of achieving the final project objective.

9.3 The final objective: research implications and policy recommendations

Objective 4: To assess the implications of the project findings for the building of flood resilience at a community level

In order to assess the implications of this research it is necessary to first ask the question, "Implications for whom?" This research was intentionally focussed upon three English coastal communities, therefore, it has always been envisioned that precedence would be given to discussing the findings in the context of UK flood-risk management. This perspective focuses upon elaborating the implications for those who produce the institutions of FRM and those who practice in accordance with them, e.g. the Environment Agency, local authorities and other responders categorised under the auspices of the Civil Contingencies Act 2004. In accordance with this particular policy-orientated context and to achieve the greatest salience, this section is split into a number of sub-sections. These sections have been composed in order that the numerous findings of the project can each be focussed effectively toward the most relevant sector of FRM. At the end of the section, specific recommendations are made as to how these findings could be used to improve FRM practice.

9.3.1 Implications for vulnerability assessment

In order to provide effective services to a population during an emergency event, it is vital to have some *a priori* appreciation of the risks faced by that population. Such an understanding is suggested to assist organisations' and authorities' in their response efforts, by enabling them to apply their limited resources in the most effective manner (Alexander, 2002). Accordingly, since the passing into law of the Civil Contingencies Act it has become a statutory requirement that risk assessments be conducted in relation to all potential hazards affecting the population of the UK. These assessments are carried out at local authority, regional and national levels (HMG, 2005). It is suggested that for these assessments to have any value it is important for robust methodologies to be used to quantify three factors (i.e. the nature of the hazards, the vulnerabilities of the exposed 'systems' and the anticipated consequences), which together constitute the risk. However, defining these characteristics is problematic. For example, Wisner (2001), problematises methods that aggregate demographic characteristics in such a way that individuals 'become vulnerable' simply due to factors such as their age or living arrangements. Birkmann *et al.* (2006a) also, discuss at length the issues surrounding what they see as the multi-dimensional aspects of vulnerability. Birkmann reflects that as a concept, vulnerability is not just something that can be easily categorised, without first contextualising how the 'system' (e.g. person; structure; supply chain) under investigation is situated, relative to a complex mix of economic, social and environmental criteria.

This project has effectively and usefully contextualised Birkmann's concerns, in that it has confirmed that aggregated indices do provide a useful **overview** of the concentration of vulnerable households in an area. However, by identifying additional patterns of social vulnerability that exist **within** the pre-defined categories of the SFVI, it has also

illustrated why index-users need to understand that even populations defined within a single index category can still possess a range of vulnerability characteristics. Acknowledging this, lends support to the understanding that any 'one size fits all' risk communication strategy or response plan will have limited potency. In effect, from an emergency-planning perspective, constrained taxonomy-centred vulnerability assessments can be seen to have their uses, but they do not necessarily account for an at-risk population's internal diversity and they need to be supplemented, with more detailed situational analyses.

However, the issue of keeping such information current does raise practical and fiscal challenges. No responder agency has the financial resources to regularly survey every hazard-exposed household in order to comply with any distinctly emergencies-focussed requirement. Therefore, the support that this project gives to the Cabinet Office's (2008a) advice on vulnerability assessment becomes clear. The Cabinet Office advises that collaborations should be fostered between the CCA-defined Category 1 responders with responsibility for public contingency planning, and other responders (e.g. PCTs), who in addition to their Category 2 responsibilities also collect, collate and utilise what might be considered as 'vulnerability-related' data for purposes unrelated to hazards (e.g. social care). By working together (in accordance with the Data Protection Act's provisions related to data-sharing for emergency planning and response purposes: HMG, 2007), lists-of-lists and paths-to-lists can be created, with which the identification and monitoring of communities' vulnerabilities (and by default, their potential emergency needs) becomes more feasible; almost to the extent that during an event such interconnections have the potential for virtual real-time utility (Dobson, 2007).

9.3.2 Implications for risk communicators

In Section 2.3 a typology of risk communication was introduced. In this section, the implications of this research for three of these communication types will be discussed. A further sub-section then assesses whether 'climate change' is an appropriate conceptual device to be utilised by those communicating risk information about extreme sea flooding to coastal communities.

9.3.2.1 Messages for general awareness and preparedness raising

This type of risk communication should be considered as a means to normalise resilience-building and adaptation in the minds of the public. It should take the form of an on-going and regular programme of communication, which occurs independently of hazard events (Mileti *et al.*, 2004). In order to engender resilience-building behaviour, however, it is important to adapt materials to the local context. Whilst this can mean messages need to be hazard-specific (see below), this project has also revealed other aspects of what it means to adapt messages for a local audience.

It has been advocated that risk communications should be circulated using multiple measures in order to reach the most diverse audience (Mileti *et al.*, 2004; Tapsell *et al.*, 2005). Accordingly, this research has confirmed that a range of broadcast and print media are recognised by the at-risk public to carry hazard and resilience-related information. Furthermore, it has also confirmed that local radio can be regarded as the most popular source of hazard-related and warning information (Sections 7.3 and 7.5.1.3). However, formal risk communication is only the first part of the resilience-building process. For these messages to encourage the spread of resilience-building activity that is capable of breaking the *status quo,* it is necessary for them to elicit 'change talk' amongst the target audience (Section 8.3.1.2.1).

Through the use of social capital theory, this project has revealed the types of social networking that are prevalent within particular at-risk communities. Having identified this, it becomes important to acknowledge that the information provided by formal resilience-building programmes, may be passed through these particular types of network (Pidgeon *et al.*, 2003). What this finding suggests is that, within these communities, message dissemination might be increased if flood-risk communications are formulated specifically for onward transmission through bonding and bridging social networks. Equally, messages may be more likely to be absorbed into and transmitted through these networks if particularly trusted members of the local community, who may be in or at the periphery of many of these networks (e.g. a local flood warden or lifeboat coxswain), can be associated with the consensus of opinion that a threat exists and that mitigation and / or preparatory actions should be taken. This suggestion adds an important local context to the existing knowledge that a consensus of 'expert' opinion on any potential threat (e.g. the EA **and** the Police **and** the Met Office suggest that…!), should be part of any risk communication (Johnson, 1987). If on the other hand, messages are formulated solely in the expectation that their content will stimulate the recipient to seek further information from a formal source (e.g. Floodline), it can be predicted that such a response would only be adopted by a very small percentage of the population. This finding also reifies the importance of Mileti *et al.*'s (*ibid.*) risk-communication 'law', which states that risk communications should empower their audience by detailing at the earliest opportunity what it is that people can actually do for themselves.

9.3.2.2 Messages to educate people in how to behave during hazard events

It has been found that even in areas exposed to low-probability hazards, a high percentage of the at-risk population are aware of household-scale flood response

measures, which they could adopt if they considered that flooding was imminent (Section 7.5.2.5). However, at the same time, few floodplain dwellers recall or identify with the formally sanctioned 'Go-in, Stay-in, Tune-in" style of warning message that is used by the authorities to prompt the public into taking these actions.

Taking these factors into consideration, therefore, the project has confirmed that the public tend to initiate their response to warnings independently of any such formulaic instructions. However, regardless of any formal message, there is a tendency for people to intuitively adopt the 'tune-in' response anyway, simply because local radio is generally regarded as a trusted source of information.

This finding attests to the importance of confirming warnings and conducting awareness campaigns (such as the BBC's "What if…?" campaign: Cameron, 2009), through the medium of local radio. Furthermore, in order to encourage, or to 'permit' (in the sense of normalising), larger numbers of the exposed community to respond effectively, such campaigns should exemplify and de-stigmatise the actions of community members (rather than 'experts') who have responded to threats, even in a small way (e.g. "So, Mrs [X], you say that when you hear a warning you always move your most treasured possessions upstairs? That makes a lot of sense.").

The more complex task of provoking at-risk communities into anticipating how they might adapt resiliently to future events (e.g. by purchasing and fitting flood-boards) will be discussed in Section 9.3.3.

9.3.2.3 Messages to warn and alert the public of impending events

It is apparent that sirens are positively regarded as a form of warning technology in areas exposed to low-probability flood hazards (Section 7.5.1.1). The general public perception is that if these devices are well-positioned they can provide an effective

'warning of last resort'. In addition to this principal warning role, however, such devices also have a secondary function. As environmental features, sirens can act as a physical indicator of a community's risk levels (see Section 2.3.1.1). This second factor sets this particular technology slightly apart from other traditional or IT-based flood-warning systems. Importantly it suggests that, despite their acknowledged limitations (Tapsell *et al.*, 2005), sirens have a capacity to generate an additional degree of risk normalisation and risk acceptance within exposed communities. Other warning technologies (e.g. FWD), by contrast, are regarded with more ambivalence, particularly where flood-risk perceptions are lowest.

9.3.2.4 Using Climate Change as a communication 'device'

Across the UK there is now evidence to suggest that the majority of the public now broadly accept the scientific consensus on climate change and its potential impacts (Ipsos UK, 2008). A majority has even been found to support the idea that people should be 'forced to act' in order to mitigate climate change (LGA, 2008). However, there is also considerable evidence that the public tend not to view climate change as a personal priority or as a contemporary concern (Bazerman, 2006; Leiserowitz, 2006; Lorenzoni, 2006; Lowe *et al.*, 2005; Stoll-Kleemann *et al.*, 2001; Weber, 2006; Whitmarsh, 2008). Furthermore, it has been found that, even amongst those individuals who do perceive climate change as a contemporary threat, there are still a range of economic, social and structural barriers that can act to prevent them from engaging with the issue on cognitive, affective and / or behavioural levels (Lorenzoni *et al.*, 2007).

To add to these understandings, this research has revealed two interesting patterns in relation to the perception of how climate change will influence coastal flood risks (Section 7.4.3). In general, the majority of this population perceives that even in a local context,

climate-change effects are already the cause of significant concern. However, in relation to flood risk in particular, these concerns are focussed along two very particular time horizons. Firstly, the effects of a changing climate on sea-flood hazards are generally perceived as a problem to be dealt with at some point in the indeterminate future. This projecting of the problem onto consequent generations appears to allow these risks to be regarded as relatively moot from an anticipatory resilience-building perspective.

By contrast, the media images and local stories, which relate to the rainfall and river flooding that has occurred in recent years, appear to have been particularly affecting. The availability of this information seems to have resulted in a widespread perception that intense rainfall events are becoming more common (Section 7.4.3). In turn, this has led to a much greater sensitivity to the suggestion that these communities might be affected by similar events **at any time**. However, despite the apparent currency of this threat, and in accordance with Lorenzoni *et al.* (2007), it could be suggested that perceiving a potential risk and responding 'appropriately' to mitigate it are not mutually contingent conditions. Despite the concerns about surface-water flooding, there is little evidence that increased risk perception (rather than direct flood experience) has stimulated a resilient response by the public any more effectively than have concerns about sea flooding. Viewed from this perspective, it becomes clear that risk communicators face particular challenges if they are intent on portraying climate-change as a factor that **is** influencing flood risk.

Weber (2006: p.2) suggests that attempts should be made to "*evoke visceral reactions*" in the public in order to animate them into engaging with climate-change risks, but this approach has been criticised as unproductive (Fischhoff, 2007; Hulme, 2007; Lowe, 2006). Defra (2006) by contrast, encourage that a frame of positivity, social unity and coordination be constructed around the issue. Such an approach, it is suggested,

conditions the public to consider the need for long-term planning and the need for behaviour change to be institutionalised across society. A challenge remains, however, in that climate itself is a statistical[2] and social construction (Demeritt, 2001; Rayner & Malone, 1998). In effect, people do not experience climate, they experience weather[3]. Climate change's very intangibility, therefore, appears to allow its projected effects to be discounted: possibly because life is considered challenging enough without the invocation of an additional, imperceptible, spectre (Lorenzoni *et al.*, 2005).

So where does that leave us in relation to communicating the issue of future flood-risks? Considering this project's findings it could certainly be suggested that the Defra approach to climate change should be regarded as more constructive. Its style of evocation melds well with the idea of 'normalising' behaviour change; whereas, one that sanctions scaring a 'recalcitrant' public into action does not (Ronan & Johnston, 2005). However, it is doubtful that the at-risk public can be provoked into adopting resilience measures simply by using this approach. Despite their expressed concerns, this population is still confused over the timescales and uncertainties inherent in what actually constitutes a contemporary 'hazardous' climate-change effect (as are many scientists: Höppe & Pielke Jr., 2006). In light of this, the importance of making explicit the fact that extreme events need to be prepared for, regardless of climate change, remains an important message in itself.

So, at present, any causal relationship between climate change and extreme flood hazards remains nebulous. However, it has been suggested that building resilience will become increasingly important as climate change effects become more conspicuous

[2] The IPCC classifies climate as the average of weather calculated over a period of 30 years (IPCC, 2007)

[3] This is not strictly true, given the modern ubiquity of opportunity for international travel. In this sense it could be suggested that those who traverse latitude or longitude can experience different climates, even if not climate change *per se*.

(IPCC, 2007). Unfortunately, communicating this aspect of the debate is not quite as straightforward as simply arranging the wording of an information leaflet or press release. The next section will return to these issues after considering what this project has revealed in relation to trust relations and the resilience of coastal communities.

9.3.3 Trust relations and the 'Resilience Agenda'

In Section 2.2.4 it was reported that some authors have criticised risk perception theories that require that the exposed publics be either aggregated or otherwise removed from the context of their lived experience. It was suggested that risk perception needs be regarded as more than just an issue of either individual psychology or the value attributes of group 'culture'. Taking this more interpretive approach to the study of low-probability hazards, this project has indeed revealed the multi-faceted nature of social risk construction within particular hazard-exposed communities.

These publics have been found to acknowledge, both their hazard exposure and their vulnerability to those hazards (Section 7.4.2). However, there is evidence of an ingrained perception that flood-risk mitigation is something to be dealt with formally through institutions rather than informally by individuals (Section 8.5.1). Issues of trust in authority have, therefore, been found to be central to the risk-construction process.

Concentrating on sea-flood hazards (the focus of this thesis), the publics' implicit trust in the protection capacity of structural defences, could be said to have been a factor in sustaining these communities for many years. It has, in effect, allowed those living within these communities to create '*privatised survival strategies'* (Giddens, 1991: p.171), which tend to subordinate sea-flood risk to little more than a putative concern. Through this affective response, households have endured risks that could otherwise have blighted the considerable capital, cultural and emotional investments that they have

been required to make in order to live where they do (whether through personal choice or otherwise) (Finucane *et al.*, 2000). However, this is a time of change. Responsibility for risk mitigation is being devolved and 'the authorities' are seeking to reject the mantle of over-riding responsibility that has been bestowed upon them (unwontedly), through the implicit trust of generations of floodplain dwellers. Instead, and in order to encourage 'resilience', the population itself is now being pulled forward, onto the risk-management stage. Whilst this process is without doubt practical and in many respects well-intentioned, the evidence suggests that it will not be straightforward.

Returning to the discussion in Section 2.2.4 it could be posited that the new FRM paradigm is perceived by the exposed public as an example of what Beck (1995: p.61) would term, the "*organised irresponsibility"* of those who configure its formal institutions. This term relates to the process, whereby, in acknowledging that floods are too indeterminate to 'know' or to entirely prevent, the authorities have positioned themselves as simultaneously responsible and yet unaccountable. This is a position that allows them, on the one hand, to take responsibility for the creation of elaborate plans for the coastal communities' future development, whilst on the other ceding to these communities an increased responsibility for coping with the extreme hazards that may sunder these aspirations in an instant. Doubtless, land-use planning instruments such as PPS25 (DCLG, 2006) will go some way toward reducing the exposure of **new** developments to flood hazards (if indeed they can be rigorously applied, given the conflicting strategic and site-specific pressures on coastal sustainability: O'Riordan *et al.*, 2006; Few *et al.*, 2007). However, the legacy of flood vulnerability (physical, social and systemic: Section 1.4), which epitomises many coastal towns, appears so embracing that ambitions to reduce it could be suggested to be irreconcilable with the new FRM mantra. Can resilience-building really be regarded as the responsibility of the citizenry

and not of ‘the state’, when it was the state that ultimately sanctioned the vulnerability’s production, for example, through the decades-long practice of permitting the construction of bungalows on the floodplain?

Despite the contentious nature of trust and responsibility, the shift toward inclusive risk management is becoming more important, particularly as flooding is becoming increasingly regarded as a social-justice issue; under which **fair** outcomes are a desired goal (Cutter, 2006; Werritty, 2006; Wisner *et al.*, 2004). Recent events have made clear that the formal institutions of state cannot actually provide the all-encompassing ‘emergency services’ that the exposed communities believe exist (Clarke, 2005; Pitt, 2008). This means that, should an extreme event materialise then countless households will, to all intents and purposes, find themselves ‘on their own’ in dealing with both the event itself and its aftermath (King, 2000).

In the face of such hazards, this project has found that many, even deprived, households can be considered as resilient to varying extents (see also: Buckle *et al.*, 2003). There **is** knowledge of appropriate actions to be taken upon warning receipt, there **are** perceptions of hazard exposure and vulnerability, and a majority of the population **is** insured (although, a substantial minority are not; Section 7.5.2). There is also evidence that therapeutic social capital exists *in potentia* for use during hazard events, even if it is not directly quantifiable *in acta*. However, given the communities’ overall ambivalence toward these extreme threats, it must be remembered that this has in fact been an investigation of what might be considered as ‘armoured systems’ (Gallopin, 2006). As armoured systems, these communities do exhibit these characteristics of resilience. However, it is also clear that these communities have not yet been tested beyond a particularly relevant threshold. A breach of the sea defences (i.e. the armour, in a very

literal sense) would in effect be the ultimate test of whether this latent resilience is any more tangible than the emperor's new attire.

It is true that individuals within these communities have been 'tested' and although this has been by lesser hazards than would constitute the potential 'worst case', these 'local champions' appear, as a result, to be more broadly risk-engaged. It is, therefore, more likely that these individuals would suffer fewer intangible effects in the aftermath of an extreme event, even if their tangible losses were considerable (Green, 1992). Unfortunately, the influence these individuals' wield within their informal social networks has been found to be strictly limited (Section 8.4.3). In fact, more generally, informal social networks have been suggested to be more responsible for the reproduction of the *status quo* than for creating new opportunities for social risk-engagement (Section 7.3.2.3). So what is to be done?

9.3.4 A 'Window of Opportunity'

Inclusion and participation are two of the principal goals of current flood-risk management policy. It is suggested that if the exposed publics can be encouraged to engage with their risks, then they will become more resilient in the face of them (Berkes, 2007). Taking Berkes' perspective forward, this project has revealed that a legacy of trust (and distrust) in authority and a concomitant delegation of responsibility to that authority, on the part of the hazard-exposed publics, means that these two goals may prove illusive. However, in the process of risk communication, the exploitation of a **window of opportunity** is regarded as being particularly important, as it can create an arena within which attitudes and behaviour toward risk can be changed (Alexander, 2000; Mileti *et al.*, 2004). What this research has shown is that there is currently such a window casting its light upon coastal populations. Although these communities feel

detached from sea-flood risks, their exposure to surface-water flooding has become increasingly undeniable, as has their sensitivity to this hazard. This provides an opportunity for open dialogue, as to how the risks associated with this hazard and by default sea-flood hazards, might be mitigated more effectively in the future.

As was discussed in Section 8.3.1.2.1, effective risk education focuses upon the creation of a discrepancy between an individual's perception of the *status quo* and her/his desired future state. In order to achieve this effect, it is important to stimulate 'change talk' that normalises the embracement of perhaps uncomfortable subjects into social discourse. As was revealed in the same section with the example of the "*County News*" style information strategies, it can be seen that the deficit-model of risk communication cannot achieve this; merely telling people what they 'should' do, is not sufficient to stimulate widespread engagement. However, local communities have, unsurprisingly, been found to possess highly contextualised local knowledges. These knowledges need to be integrated into local decision-making practice if effective measures are to be implemented at the most appropriate scale. Furthermore, if it is ever to become trusted and normalised, this integration needs to be publicly auditable through the creation of formalised processes of implementation (Trettin & Musham, 2000). One possible way to do this would be through broadening the remit of the Local Resilience Forum, to include greater community participation and representation. This would add a local perspective to what is currently regarded as the exclusive dominion of the formal responder organisations. Such collaboration would, of course, open up the formal institutions of contingency planning to the public gaze. However, whilst this might be uncomfortable for some it would introduce a means through which any assumptions, made by the public **and/or** by the formal agencies, about what is genuinely achievable in any particular emergency, could be deliberated and harmonised.

The LRF is not the only forum within which these conversations need to occur though. If flood hazards increase in the future in the ways that are projected, then exposed communities will soon be facing reduced odds in their gamble as to whether or not they will be affected by an extreme flood event. This is why the deliberation of the wider issues of sustainability, such as land-use planning, which are being influenced by climate change projections too (Cabinet Office, 2008b; DCLG, 2006), also need to be aired in as public a forum as possible. In effect the normalisation process requires dialogue that encompasses not just hazards, but all the social, environmental and economic issues that embody community sustainability (Mileti, 1999). As Bazerman (2006) points out:

> Responding to cognitive barriers, while ignoring organizational and political barriers, will not solve the problem. (*ibid.*: p.13)

It is becoming increasing clear that the issue of climate change is such that allowing these sustainability considerations to be undertaken as a form of 'business as usual + climate change', is no longer tenable. As Pitt (2008) has highlighted, the nation's drainage infrastructure appears to be no longer 'fit for purpose' and at the same time the ABI (2006) has raised serious concerns over the protection standards of its sea defences. At-risk communities know these facts and yet, in relation to flooding, they perceive that, despite this knowledge, local institutions are still being manipulated (effectively *in camera*), in ways that intensify rather than mitigate some of these risks (Section 8.5). Therefore, for these communities to take any climate-change commitment (and by default any risks related to low-probability hazards) seriously, there needs to be concerted effort toward making the planning and management of their transition into the future as transparent as possible (O'Riordan *et al.*, 2006).

Multiple publics have a **right to know** what the potential effects of hazards in their environment may be and they have a **need to know** what they can do to reduce their

risks (Walker *et al.*, 1999). This does not mean that these publics need to be unnecessarily alarmed, through the disproportionate use of emotive images and publicity, but that they should be given the opportunity to understand and to participate fully in the process through which decisions that relate to them are made. Afterall, how can communities be expected to build resilience if they are not privy to the 'building codes'?

9.3.5 Policy Recommendations

Having discussed the findings of this research, it now becomes important to distil this information into a form that may be useful to those interested in improving FRM practice. This section, therefore, lays out a series of seven formal policy recommendations.

Recommendation 1: *This project confirms that the local diagnosis and monitoring of an exposed population's vulnerability to flooding should to be conducted through collaboration between interested agencies, rather than simply through the use of high-level taxonomic indices.*

Recommendation 2: *In order to increase their effectiveness and to engender wider public engagement, formal resilience-building and risk-communication strategies should utilise local radio and elicit the participation of 'resilient' members of the local community into campaigns.*

Recommendation 3: *Risk communications targeting those exposed to low-probability flood hazards should be formulated as 'reminders', in such a way as to enhance the positive effect of making people believe that any responses they implement are actually their own idea.*

Recommendation 4: *In areas where extreme flood hazards represent a potentially high risk to life, this research indicates that investment in siren technology should be considered in the context of their value as 1), a warning technology and 2), as a means of normalising the publics' day-to-day consideration of extreme flood risks.*

Recommendation 5: *This research supports the findings of Twigger-Ross et al. (2008), by recommending that when developing warning strategies for exposed populations, the relative potential of a range of technical* ***and*** *non-technical measures should always be considered on an equal basis.*

Recommendation 6: *In order to normalise 'resilience-thinking' it is important that contingency planning and decision making are conducted through a participatory approach.*

Recommendation 7: *In order to increase the public profile of resilience-building, it is recommended that in areas exposed to low-probability / high-consequence sea flooding, consideration should be given to creating the mid-level institutional position of Community Flood Coordinator.*

9.4 Review of methods

In Chapter 4 a detailed discussion took place in relation to the methods employed to conduct this research project. A multiple-method approach was described, which utilised both quantitative and qualitative data. The intention at the outset was to link these data in a way that could support the findings made with one method by identifying associations with findings from another (Mason, 2006). This approach was informed by critical-realist philosophy (See Section 1.2) and the process of triangulation that it would

facilitate was considered to be an important means through which to validate the whole research process (Hoggart *et al.*, 2002).

Quantitative techniques were used initially, as a means to sample a population that could be regarded as being exposed and vulnerable to the 'real' risks of flooding. This was a straightforward process of using the existing SFVI index applied to census data. Once the sample had been selected, the survey instrument was then used to produce a substantial dataset of information. As well as producing categorical data, the survey was intentionally weighted toward the use of open questions; with each of these attracting a range of responses. Whilst such data might be considered to be qualitative in nature, a flexible coding system was applied to these responses in order to facilitate SPSS analysis. In effect this qualitative data was converted into and treated as quantitative data (Bryman, 2006).

As encouraged by Baxter and Eyles (1997), the initial analysis of these data was led by hypotheses founded upon a substantial literature base and consisted of straightforward operations to identify significant relationships between variables. Overall, this extensive-research phase of the project used methods that contributed to an understanding of concepts in breadth, as they facilitated the quantification of demographic characteristics and patterns of perceptions and other phenomena occurring across a wide spatial area, as well as a wide social and relational 'space' (Massey, 2004).

Once the quantitative data had been collected, coded and subjected to preliminary analysis, the research passed into the qualitative phase. For the focus-group discussions, QDA software was used to create a structured but flexible coding regime, in order to identify phenomena and concepts that emerged from within this series of (relatively) free-flowing group interactions. This data was to provide the constructivist

backbone to the interpretation, of how these objectively 'vulnerable' populations perceived and engaged with particular flood risks. In effect, this phase of the project was originally intended as a means to illuminate the concepts identified in the earlier analyses, by putting 'meat on the bones' of the quantitative data (Bryman, 2006).

What actually evolved provided a much more interesting and informative means to interpret concepts as they were perceived, not by a 'vulnerable' population *per se*, but by a population of individuals with complex and conflicting priorities; many of which were only incidental to any consideration or even acknowledgement of hazard exposure. During the analysis process, this emerging dichotomy between the methods resulted in an increasing impression that instead of linking together, the results were in some respects irreconcilable. Strauss and Corbin's (1998: p.31) proclamation that, "*Comforting but overly simple positions, such as…"they complement each other," will not provide sufficient guides in your work*" appeared particularly apposite. Yet, all of these methods were valid. The risk constructions emerging from the qualitative data, which tended to attenuate perception of severe threats, did not negate the fact that "*the dangers* [associated with storm-surge flooding] *are only too horribly real*" (Douglas, 1994: p.29). Nor did these data devalue a wealth of research (i.e. the literature base), which has shown repeatedly that it is certain sectors of society that almost inevitably bear the brunt of disaster (e.g. Buckle *et al.*, 2003; Fordham & Ketteridge, 1995; Wisner, 2001). However, as Mason (2006) suggests; just as the reflexive nature of the process of interpretative analysis revealed the values and perceptions that created "*the particular"*, so too did it also reveal their ambiguous relationship with the "*big*" (Section 4.8).

As an example, in Chapter 6 quantitative data were used to reveal specific patterns of vulnerability at a broad scale. This effectively created a context within which to explore the nature of these and other phenomena at a finer resolution. This is not to say that

'vulnerability' was being transposed to this more focussed level, but that the census data was, in effect, contextualising and informing the interpretation of what **might** constitute vulnerability (Hoggart *et al.*, 2002; Sayer, 1992). The survey provided a range of these individual perceptions, knowledges and characteristics, expressed by the smaller random sample. In this stage of the analysis, responses were re-categorised and compared in order to develop a more subjective view of what constituted a percept of either vulnerability or risk for these individuals. Even using the survey approach, however, aspects of individuality were drawn out through the use of the open-questioning technique. The responses to these questions, although coded, provided more validity to the understanding of personal knowledges, values and perceptions than had previously been achieved through ticks in researcher-defined boxes (Fielding *et al.*, 2007). But this was not the end. To follow those at macro and meso-scale, the analysis at the micro-scale, which explored the focus-group transcripts, provided further depth. These techniques effectively "gave voice" to the individuals, and revealed the complexity of their situational contexts (Strauss & Corbin, 1998). It was only at this stage that the true value of using multiple methods became clear. This occurred with the discovery that particular phenomena identified during the earlier analysis were not as they seemed. The quantitative analyses had, indeed, been adequate and appropriate to identify taxonomically-defined vulnerability (Section 6.3) and also a widely expressed concern regarding the likelihood of flooding (Section 7.4.2). However, it was only during the more interpretative focus-group analysis that the populations' contrasting perceptions, of both their **vulnerability** to surface-water flooding and of their **resilience** to sea-flooding, emerged clearly from amidst the dichotomous milieu of animosity and ambivalence that surrounded the issue of trust in authority (Section 8.5.1). By finding this dichotomous trust relationship, it becomes harder to sustain any suggestion that the quantitative analyses alone could ever have been regarded as a means to find an 'objective' truth.

Stepping briefly aside from risk perception, the use of social capital as a lens through which to investigate these communities also proved enlightening. Again the mixed methods were important for drawing out different aspects of this concept, with quantitative data being used initially to identify its elements within the population (Section 6.4). Once the trust, reciprocity and networks had been quantified, the survey data were also helpful in identifying how aspects of the concept influenced the networks' potential; both as a conduit of risk information and as a means through which risk perceptions could be confirmed or adjusted. Quantifying the preferential use of bonding and bridging networks, over those of hierarchically-linked connections, was particularly important from a risk communication perspective. Social capital has been found to be particularly influential in determining community response to warnings (Section 3.2.3). Therefore, by defining a means to identify prevalent forms of social interaction, this project could be suggested to have provided a way to predict or at least to anticipate the manner in which these communities might respond to risk communications during an emergency event. For example, according to Buckland and Rahman (1999), these communities might be expected to respond less questioningly to warnings than might more hierarchically-linked communities (Section 3.3.3). These findings in relation to social interconnectedness are useful, in that they provided evidence that 'social safety nets' do exist for the majority of this population. However, the importance of the concept's role in resilience-building was found to be secondary to its function in maintaining the *status quo* (Section 8.4.4).

As stated above, one initial rationale behind the use of mixed methods was that it provided a means to achieve triangulation. However, as the qualitative analysis of the focus-group discussions progressed, what transpired was that a more 'complete' interpretation and contextualisation of concepts was possible than had been expected;

by the author at least (Bryman, 2006). The project in effect corroborated Bryman's suggestion that:

> "Multi-strategy research frequently brings more to researchers' understanding than they anticipate at the outset." (*ibid.*: p.111)

Whilst this was all perceived as a very positive outcome by the author, this issue of defining what the researcher 'understands' the data to say does underline another issue. With two epistemologically distinct datasets being brought together through a parallel process of analysis and interpretation, the issue of researcher positionality becomes a relevant consideration. Researcher positionality **does** influence the manner in which any data are interpreted and recognising this fact goes some way toward reducing his/her tendency to believe that any one 'truth' has been discovered (Flowerdew & Martin, 2005). Baxter and Eyles (1997) suggest, however, that acknowledging the positionality and the 'power' of the researcher through the adoption of a reflexive approach need not be regarded negatively, for…

> "…such reflexivity is a strength for evaluating qualitative work, allowing a conscious deliberation of what we do, how we interpret and how we relate to subjects." (*ibid.*: p.505)

From the outset, the author had purposively sampled populations that exhibited certain attributes of flood vulnerability. It could, therefore, be posited that the subsequent analyses might be biased toward the search for phenomena that would corroborate that objective classification. Whether this proved to be the case, however, requires some reflection by the reader. Baxter and Eyles (*ibid.*) also suggest the importance of allowing the reader to ascertain for him or herself whether the methods were appropriate and if the interpretations truly reflect the data described. Such scrutiny is afterall, a fundamental part of the scientific process that facilitates the investigation as to whether findings have firm foundations and, therefore, represent new knowledge, or whether

research has been steered by some partisan predisposition that liberates nothing of value from the "*bloomin' buzzin confusion*" (James, cited in: Kuhn, 1996: p.113).

Whatever data were produced and whatever the interpretation that was applied, it could be suggested that only a series of snapshot images, of not only the lives of the research participants but of the wider exposed communities, were achieved. Expressed in this way it becomes clear that such images could never be regarded in any sense as representing an objective reality. Concepts such as vulnerability and resilience are, after all, dynamic; changing as they do across temporal cycles, through scales of shock, or through other more persistent but nonetheless affecting processes (Buckle *et al.*, 2003).

So what knowledge has the project produced? The first thing that should be stated is that this research has not been focused on the exploration of **law***.* The coastal populations that were investigated represented open systems, therefore, as with the 'images', whatever phenomena were identified may have been transitory in nature and subject to change (Hoggart *et al.*, 2002). In light of this, whether any **truth** was found is a matter for the reader. However, the proposition is that the dual contexts (quantitative and qualitative) within which the phenomena were identified support what Sayer (2000: p.43) would term their "*practical adequacy*", as being a means to enrich our understanding of important and policy-relevant concepts; such as resilience and vulnerability. The project has identified aspects of the social life of exposed communities in ways that challenge and inform objective classifications applied to them. It might indeed be appropriate to label a community (of place) as 'vulnerable' or 'resilient' for certain purposes. However, providing this richer perspective has illustrated how unquestioned institutions of trust and responsibility can mediate how these concepts are socially constructed and experienced at the individual, network and community scales.

9.5 Recommendations for further study

This investigation has concentrated on the discovery of relationships between risk perception, social networking and the flood resilience of three coastal communities objectively defined as both deprived and vulnerable to flooding. Useful knowledge has been created, from which have emerged a series of policy-focused recommendations. However, in drawing the thesis to conclusion it becomes clear that the knowledge gained from this project could be further enhanced, by conducting additional research.

This project has been specifically focused upon particular communities exposed to low-probability flood hazards. Due to the nature of the communities surveyed, the three sample populations could be considered to be socially homogeneous (i.e. predominantly white and English). This homogeneity is unproblematic, in the sense that the random-survey strategy produced a broadly representative sample of the wider population of the three towns (Chapter 5). However, such homogeneity is not characteristic of the wider population that is exposed to coastal flood hazards in the UK. In the work that stimulated the inception of this project, Walker *et al.* (2006) found that the majority of the deprivation effect they attributed to the coastal population resulted from the concentration of deprivation in two predominantly urban areas; Yorkshire and Humberside and London. In total these two regions account for 60% of the total population exposed to sea-flood hazards in the England. These two regions are not as socially or culturally homogenous as are the populations of many of the nation's smaller coastal towns (House of Commons, 2006). In consideration of this, it could be suggested that the findings of this project may not be directly transferable to these more diverse populations (Perry & Nelson, 1991; Robertson, 2005).

This project has recommended that in order to increase participatory risk-governance, new processes need to be created through which to engage the public more effectively with decision-making. In order to enhance the normalisation of participation in this manner, it has been suggested that these processes encompass not just risk management, but also wider issues of community sustainability. From an emergency planning perspective, it could be suggested that such a process has been introduced through the Civil Contingencies Act 2004, in the form of the Local Resilience Forum (LRF). Evidence suggests, however, that the LRF concept is currently regarded as being focused strongly "*on partnership working rather than community engagement*". (Twigger-Ross & Scrase, 2006: p.9). In effect LRFs appear to provide little more than a forum, for organisations defined as 'responders' under the CCA, to objectively quantify risks in their geographically-defined area and to prepare affiliated contingency plans. There appears to be little opportunity for broader public engagement with this process.

The final research recommendation takes the issue of public engagement with risk management decision-making in a slightly different direction. This research has confirmed the popularity of using a 'local face' to deliver risk communications. From this perspective, volunteer flood wardens are highly regarded as a flood-warning resource (Shaw *et al.*, 2005; Twigger-Ross *et al.*, 2008). They are also regarded as a useful 'change aid' in relation to building community resilience (Tapsell *et al.*, 2005). However, the recruitment and retention of individuals to perform this role has been acknowledged to be problematic, particularly during the potentially long periods of quiescence between hazard events (Section 8.4.2). Whilst a guide to the development of volunteer flood warden schemes does exist (E.A., 2004), this issue of recruitment and retention raises questions as to whether the 'flood warden' role could be developed, in order to become more inclusive of a wider range of community risks. In the US, a system of Community

Emergency Response Team (CERT) training has resulted in many thousands of individuals being trained in basic rescue and first-aid techniques (Brennan & Flint, 2007). Whether such a system could be made to work in the UK is an interesting question. However, given both the inevitable and acknowledged limitations of formal civil-contingency arrangements for severe hazard events (Clarke, 2005; Pitt, 2008) and the scale of the potential threat posed by (as one example) the storm-surge flood hazard around the UK coast (Cabinet Office, 2008b), perhaps now is a good time to investigate how new and innovative methods might be used to empower those who live and work in hazard-exposed areas to mitigate their own risks and those of their wider communities.

In support of these suggestions, the following recommendations are made regarding areas in need of further research:

> **Research Recommendation 1:** *Additional research should be carried out to ascertain if the findings of this project are transferable, to a more socially and culturally heterogeneous, urban population.*
>
> **Research Recommendation 2:** *Research should be undertaken to identify whether the Local Resilience Forum represents a process that could be used to increase public participation in flood-risk management*
>
> **Research Recommendation 3:** *In order to inspire community-scale resilience building, research should be undertaken, in the UK and the wider world, to ascertain what constitutes good practice in the recruitment, training and retention of Community Emergency Volunteers.*

9.6 The thesis' contribution to new knowledge

This thesis has expanded upon a significant amount of existing literature related to the perception of flood risk. Importantly, a particularly novel approach was used. In contrast to earlier research, this investigation concentrated on populations exposed to a low-

probability high-consequence sea-flood hazard, rather than on those who had already been flood affected. The knowledge that this investigation has produced can be summarised as a series of key points. The project has:

- Used survey techniques to reveal the utility and limitations of using high-level social data for local-scale vulnerability assessment
- Confirmed that the media has a stronger influence in changing individual's risk perceptions than do the social networks to which they belong
- Used social capital theory to identify the respective roles of bonding, bridging and linking networks in the communication of flood risk
- Identified that only a small minority of the public link with the agents of the formal FRM organisations in order to address their perceived flood issues and/or concerns. The majority seek support in these matters through more laterally connective social networks.
- Identified a limited role for 'local champions' in building wider community resilience to flooding
- Identified that direct experience of flooding (cognitive availability) is an important but not universal factor in the adoption of flood-resilient responses
- Qualified and illustrated in schematic form the nature of risk perception within coastal communities, particularly in relation to how individuals' trust in authority influences their perceptions of the formal FRM institutions' capacity to mitigate flood risks

- Identified the importance of building trust with the public through including them in the deliberation of all aspects of community sustainability, not just contingency planning.

9.7 Final words

The findings and recommendations of this thesis have been informed by an investigation conducted amongst the members of three pragmatic, knowledgeable and yet 'vulnerable' coastal communities. For these individuals the threats related to extreme storm-surge floods comprise but a single risk amongst many. For this reason, it has been no real surprise to learn that most thoughts of this threat have been mentally exiled, to a point far away on a distant horizon. It is Handmer (2003) who states, '*we are all vulnerable'* and it could be suggested that in the face of such a hazard this axiom is true. Yet, Handmer qualifies his statement by suggesting that instead of seeking vulnerability, the lens should be reversed and the gaze more positively focussed upon the investigation of resilience. Taking this perspective, this research has revealed aspects of lay knowledge and of social interconnection that can be regarded as 'resilience'. Practicality and experience have equipped some with tools for response and most with a means to recompense many of the tangible losses that may be suffered. Yet, institutions are powerful guides, and history and culture dictate that few will take more significant steps to armour themselves more substantively from harm. Those who seek to change this habitude must acknowledge this legacy and resource its change from within. It is clear that such change will not come quickly, but this does not diminish the importance of the goal.

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The End

Or is it the beginning?

Appendix 1:

Final Survey Questionnaire

Mable_____

Coastal Communities and Flooding

What do you think?

Thank you for agreeing to take part in this questionnaire survey. I have designed it to gauge both your attitudes and opinions regarding flooding, and how people in coastal communities understand and talk about this issue.

Your opinions and attitudes are important and for this reason I would like to ask that you answer as many questions as possible. The questionnaire is designed to be completed by *one* adult in the household. *At no point in the questionnaire are details required that could identify you. All your responses will be treated strictly anonymously.*

The findings of the project will be useful to both local and national agencies. They will be able to use the information you provide to improve their ability to communicate about flooding with coastal communities like yours and the public in general.

The research project is funded by Lancaster University in collaboration with Staffordshire University's 'Institute for Environment and Sustainability Research'.

If you require further information about completing this questionnaire, or information about the survey's findings, please do not hesitate to get in touch with me.
My contact details are:

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Questionnaire

1) In the grid below please rank in the right hand column what are **for you** the **three** most important local environmental issues in Mablethorpe at the moment

(i.e. Most important = **1**, Second most important = **2**, Third most important = **3**)

Local Environmental issue	Rank
Air quality	
The loss of the countryside	
Traffic congestion	
Litter in the streets	
Noise	
Water pollution	
Housing quality	
Recycling	
Dog mess	
Youth crime	
Flooding	
Other: **please state** ----------	

In this set of questions I am seeking your views on flooding:

2) a. Where have you heard or seen **flooding** being mentioned in the **media**?
(Please don't limit your thoughts to just local flooding)

- o Television news ☐
- o Television Documentaries ☐
- o Newspapers ☐
- o Radio ☐
- o Internet ☐
- o Never seen/heard it mentioned ☐

Tick all boxes that apply.

- o Other: (**Please state**) ----------

2) b. Has your understanding of how flooding **might affect you** been influenced by the **media coverage** of the issue?

YES ☐ NO ☐ UNSURE ☐

2) c. If **YES** to **2 b: In what way** has your understanding of how a flood **might affect you** been influenced by this **media coverage?**

Answer: _____

_____

3) a. Have you talked about local flooding issues or concerns **formally** with any official or professional person in the last year (**e.g.** a local councillor, an Environment Agency officer, an insurance agent, at a formal meeting)?

YES ☐ NO ☐ UNSURE ☐

3) b. If **YES** to **3 a:** please state who you have spoken to (e.g. a local councillor):

Answer: _____

4) a. Have you talked about local flooding issues **informally** with anyone else in the last year?

(Tick all boxes that apply, once)

A Partner	☐	A relative living in the town	☐
Your child / grandchild	☐	A relative from out of the town	☐
Your Father / Mother	☐	In a family group	☐
Someone else who lives with you	☐	In a group of friends	☐
A neighbour	☐	Someone in a public place	
A work colleague	☐	(e.g. street /pub/shop/library) who	
A friend living in the town	☐	is not a friend or relation	☐
A friend from out of the town	☐	No, I haven't talked about it	☐

Other: (**Please state**) _____

4) b. Has your understanding of how local flooding **might affect you** been influenced by **talking** about the issue?

YES ☐ NO ☐ UNSURE ☐

4) c. If **YES** to **4 b:** whose opinion or information about local flooding has influenced you most (**e.g.** partner, a friend in the area, local councillor, other)?

Answer: _____

4) d. If **YES** to **4 b: In what way** has your understanding of how local flooding **might affect you** been influenced by **talking** about the issue?

Answer: _____

_____

5) Have you or any of your close family or friends ever experienced a flood that caused damage to your/their property? YES ☐ NO ☐ UNSURE ☐

6) In the grid below please tick any source of flooding that you think could affect your home:

Potential cause of flooding	Tick
Flood from overflowing drains	
Flood from the sea	
Flood from a river	
Other: **(please specify)**	

7) a. How likely is your home to be flooded? **(Tick one box)**

Very likely	☐	It will never happen	☐
Moderately likely	☐	I have thought about it,	
Not very likely	☐	but I'm not sure	☐
Very unlikely	☐	Don't know	☐

7) b. Why do you think this?

Answer: _____

_____

8) a. Would you expect to get any warning of a flood before it arrived?

YES ☐ NO ☐ UNSURE ☐

8) b. If **YES,** where do you think the warning would come from:

Answer: _____

9) Can you suggest three things which **you** could do if you got a warning that your street (including your home) was going to be flooded in the **next few hours?**

Answer: 1) _____

2) _____

3) _____

10) Who would you go to or contact first if you needed help **during** a flood?

Answer: _____

11) a. Imagine the possibility of a flood affecting your home next winter. What, if anything, could you do **now** to help you cope with it?

Answer:

_____

_____

11) b. What, if anything, do you think could be done in Mablethorpe to help the town cope with flooding in the future?

Answer: _____

_____

12) Here are some statements about **flooding**. Could you please **tick a box** to indicate on the scale of 1–5 how strongly you agree or disagree with each statement?

	Strongly **Agree** **1**	**2**	Neither agree nor disagree **3**	**4**	Strongly **Disagree** **5**	Don't Know
I have confidence in Mablethorpe's flood defences	☐	☐	☐	☐	☐	☐
My life would be badly affected if my home was flooded	☐	☐	☐	☐	☐	☐
This community takes the risk of flooding seriously	☐	☐	☐	☐	☐	☐
People around here would help each other out if a flood happened	☐	☐	☐	☐	☐	☐
Climate change is already making flooding more likely	☐	☐	☐	☐	☐	☐
Flooding is a natural process that cannot be avoided	☐	☐	☐	☐	☐	☐
I'm not too worried about being flooded, I could cope with it	☐	☐	☐	☐	☐	☐

13) Do you have a household insurance policy which covers you for flood damage? YES ☐ NO ☐ UNSURE ☐

I am now going to ask you some questions about Climate Change:

14) Of any relatives friends or contacts that you have, whose opinion would you most trust if you were to think about how **climate change** might affect **you** (e.g. partner, a friend in the area, work colleague, other)?

Answer: _____

15) Here are some statements on **climate change**. Could you please **tick a box** to indicate on the scale of 1–5 how strongly you agree or disagree with each statement?

	Strongly **Agree** 1	2	Neither agree nor disagree 3	4	Strongly **Disagree** 5	Don't Know
Climate change is a real problem	☐	☐	☐	☐	☐	☐
I am too confused by what I hear about climate change to decide if it is a problem or not	☐	☐	☐	☐	☐	☐
Climate change will do more good for Mablethorpe than harm	☐	☐	☐	☐	☐	☐
I think my community is taking climate change seriously	☐	☐	☐	☐	☐	☐
There are much more important things for me to worry about than climate change	☐	☐	☐	☐	☐	☐
I think it is clear that climate change is already happening.	☐	☐	☐	☐	☐	☐

The next set of questions is a bit different; they are about community life. Your responses to these questions are important to me because floods affect communities as well as individuals.

16) Suppose you found your sink was blocked, but you did not have a plunger to unblock it. Who in your street would you feel comfortable asking if you could borrow a plunger? (**Tick box**)

- Everyone ☐
- Most People ☐
- Only a few people ☐
- No one ☐
- I've just moved here, I don't know ☐

17) I'm using the word **community** in some of my questions. What do you think of as being "**your community"?** Is it:

- Everyone living in Mablethorpe, Trusthorpe and Sutton on Sea ☐
- Everyone living in Mablethorpe ☐
- Everyone living in the streets around yours ☐
- People who attend the same club or church group as you ☐
- Just your family and friends ☐
- I don't know; I don't think about it ☐
- I don't feel that I'm part of "a community" ☐
- Other group ☐

(Please describe) ----------

18) Have you in the last 12 months done any of these things, unpaid, in Mablethorpe? (Please **do not** include things that you have done for close relatives).

Tick all boxes that apply, once

- o Visited an elderly or sick person ☐
- o Done shopping for someone ☐
- o House sitting ☐
- o Mown a lawn, cleaning or other routine jobs for someone ☐
- o Decorating, or any kind of home or car repairs for someone ☐
- o Baby sitting or caring for children ☐
- o Looked after a pet for someone ☐
- o Given advice about something or helped with letters or form filling ☐
- o Transported or escorted someone (to hospital or on an outing) ☐
- o Improved the environment, such as picking up litter or sweeping the pavement ☐

Is there anything else you've done for someone in your local area?

(Please state) ----------

19) In the last 12 months have **you** taken any of the following actions in order to help with an issue affecting your community or Mablethorpe in general?

- o Raised money through a sponsored event ☐
- o Helped organise a petition ☐
- o Contacted a local council official ☐
- o Contacted a Member of Parliament ☐
- o Contacted some other National Government official ☐
- o Contacted a local radio or television station or newspaper ☐
- o Attended a public meeting ☐
- o Attended a tenants' or residents' group ☐
- o No local issues interested me ☐
- o There have been no local issues needing action ☐
- o No, for another reason

Tick all boxes that apply, once

(Please explain) _____

20) Do you take part in any of these activities in Mablethorpe?

- o Hobby/sports clubs ☐
- o Local community or neighbourhood groups ☐
- o Groups for children or young people ☐
- o Adult education groups ☐
- o Home selling group (e.g. 'Avon') ☐
- o Groups for older people ☐
- o Environmental groups ☐
- o Health, disability and welfare groups ☐
- o Political groups or Trade union groups ☐
- o Religious groups ☐
- o Other group:

Tick all boxes that apply, once

(Please state) _____

21) Would you say that…?

- most of the people in your street can be trusted ☐
- some can be trusted ☐
- a few can be trusted ☐
- no-one can be trusted ☐
- I've just moved here, I don't know ☐
- I don't know; I don't think about it ☐

Tick one box

Background Information

Please note: It is important that I ask this last set of questions so that I can develop a better understanding of the people who took part in the survey. *Your responses to these questions will be treated anonymously and they will not be passed to any other person or used for any purpose other than this piece of research.*

22) Is this property your main place of residence? YES ☐ NO ☐

23) How would you describe your home circumstances? (**Tick box**)

Owner-Occupier/ Mortgage ☐ Private tenant ☐

Council/ Housing Association Tenant ☐ Other ☐

24) Do you occupy (i.e. have furniture in and spend time in) the ground floor and/or basement level of your home? YES ☐ NO ☐

25) How many bedrooms does your property have? _ _ _ _

26) How long have you been living in this house? _ _ _ _ years _ _ _ _ months

27) How long have you been living in Mablethorpe? _ _ _ _ years _ _ _ _ months

28) How many people live in your household? _ _ _ _ _ adults

_ _ _ _ _ school-age children

_ _ _ _ _ children under 5

29) Your Gender Male ☐ Female ☐

30) Your Age (**Tick box**) 18-24 ☐ 25-29 ☐ 30-44 ☐ 45-59 ☐ 60-64 ☐ 65-74 ☐ 75 + ☐

31) Do you have any adults 75 years of age or over living with you? YES ☐ NO ☐

32) How would you describe your work status? (**Tick box**)

Full Time ☐ Part Time ☐ Unemployed ☐ Retired ☐

Incapacitated ☐ Other: **(Please State)** _____

33) Do you or does anyone in your household have any long-term illness or disability that limits (your/their) everyday activities? (Please include problems which are due to old age) YES ☐ NO ☐

34) Is there a car or van normally available for private use by you or any members of your household? YES ☐ NO ☐

35) What is your nationality?

(Please State) _____

36) How would you describe your ethnic background?
(**e.g**. White, Black-Caribbean, Black-African, Indian, Pakistani, Bangladeshi, Chinese)

(Please State) _____

Please turn to final page

Are there any comments you would like to make about flooding, climate change or your community?

Comment:

The next important stage of this research project will take place in the next two or three months. It will involve small groups of people who have completed this questionnaire taking part in a discussion about the issues raised. The discussion will be informal and will be held at a venue local to you in Mablethorpe with refreshments available.
If you would be interested in taking part in one of these discussion groups could you please put your contact details below?
NB. These details are required for contact and administration purposes only, they will be held in confidence and they will be destroyed at the end of the project.

Name/Address: ----------

Contact Telephone no.: ----------

Email: ----------

That is the end of the questionnaire. Can I please ask you to check that you haven't accidentally missed any questions?

Your questionnaire will be collected as we arranged

I would like to take this opportunity to thank you for your thoughts and time, I really appreciate it.

Appendix 2: Focus Group Topic Guide

1. Housekeeping issues (5 mins):

Welcome and thank you for attending

Introduce research; explain aims of group discussion

Explain reasons for tape recording; assure anonymity and ask permission to record

Explain use of Post-it notes (as memory aid / 'off-topic' issue highlighter)

Explain need for moderator's intervention if straying 'off-topic'.

Payment to be made at the end

2. Group Introductions (5 mins):

Ask participants to introduce themselves (basics: name, street lived in, how long for).

Does anybody know anybody else already?

3. Flooding three statements (15 mins):

Here are three statements taken from the questionnaires about flooding which are representative of the range of different opinions expressed in the survey; I'd like you to describe your reaction to them all and identify which statement you feel you are in most agreement with:

1. "*As for flooding I can't help erring on the side of an "it's out of my hands" train of thought, with fingers crossed."*
2. "*Sea defence work done over the last few years, along with drain improvement seems to have cured the problem of flooding*"
3. "*I think it's just a matter of time before the sea floods again due to rising tides and climate change*"

4. Preparedness (25 mins):

Accepting that it is always possible for structural defences to be overtopped (e.g. Carlisle, Sheffield), I'm now going to ask you to suspend your personal beliefs and ask that for this next stage we should agree that the flooding of your street and home is possible.

1. How prepared do you think that the people in your street would be for a flood?
2. Can you think of any measures, other than building higher defences, which your community could take to improve its preparedness or resilience to flooding?
3. What steps do you think that you could personally take to make your household more flood prepared or flood resilient? What (who?) would make you take these steps?

   Prompts:

   - Is this something that you've talked about with anyone?
   - Do you think it's important that people should be aware of what they can do to reduce possible flood damage?
   - How have you heard about these measures / how would you find out more about flood protection?
   - Who would you trust to provide you with information about the chances of flooding or preparing yourself for a flood?

5. Discussion of Measures (25 mins)

Continuing on from the last point I'm now going to ask you to consider some alternative ways that communities could be encouraged or motivated to become better prepared to cope with a flood. (give out list). Can you tell me how you react to these suggestions? How do you think that they would work for you? Which method do you feel that you would appreciate most?

1. The use of local newspaper and TV advertising campaigns
2. Education programmes in local schools
3. A local group (similar to neighbourhood watch) or a local person with responsibility for providing information and guidance
4. Environment Agency leaflets through your letter box, or a personal visit or telephone call from Environment Agency personnel
5. Insurance companies requiring you to do things to protect your house and contents in order to get insurance cover for flooding

6. A law requiring you to protect your house against floods if you live in an area that could experience flooding **

7. Something else?

**e.g. In Germany a new law states: '*Everybody who is prone to flood hazards is obliged to implement mitigation measures in accordance with his possibilities and abilities'*.

6. Concluding comments, thanks and remuneration

Appendix 3: Example Key-Informant Interview Schedule:

Emergency Planning Officer:

1) Role

- What is your role (and/or that of your organisation) as regards flood incident management (FIM) in [town]?
- What is your personal professional experience of:
  - flooding and managing flood incidents?
  - dealing with public concerns over flood risk?
- What is your understanding of the terms *vulnerability* and *resilience* in relation to flooding?
- What is your experience of talking to/working with flood vulnerable groups?

2) Community

- Can you describe your understanding of the demographic nature of the population of [town]?
  - What do you see as being the strengths and vulnerabilities of the town and population of [town] in relation to flood risk?
  - Do you see there as being any particularly vulnerable / resilient groups or places in the town in relation to flood risk?
  - If so, why do you think this is?
- How would you describe your understanding of the 'community spirit' (by which I mean community cohesion, co-operation or social networking) in [town]?
  - Is this any different from other towns for which you are responsible or where you have worked?
  - If so, why do you think this could be?

3) Flooding

- What do you know about the town's flood history?
- How would you describe the current level of flood risk to [town]?

- What is your understanding of the local implications of climate change?
- Please describe the warning and response systems in place for [town] (i.e. the staged responses) and who is responsible for each stage?
- What is your experience of the ease / difficulty in engaging the public with flood risk reduction initiatives in [town]?
    - In your experience are there any particular types of people who appear to be more receptive than others to advice in relation to a low probability risks?
- What is your experience of working with the media in relation to flooding issues?
    - Is there an Emergency Media Forum covering the area?
- Are you aware of any informal flood mitigation measures being used in the town (e.g. has any individual or group of people installed some form of demountable flood door or barrier to protect their homes?)

4) Council

- Do you serve on the Local Resilience Forum (LRF)? *If not, who does?*
    - Do you feel that there is any need to influence the LRF in relation to its decisions regarding flood risk in [town]?
        - Why?
    - Do you know if the LRF invites representation from community groups at it's meetings, or does it solely comprise CCA responders?
- Have you sought to foster any working relationships with specific community groups or institutions within [town] (apart from your commitments to other Civil Contingencies Act responders)
    - If so how successful have these been compared to similar initiatives in other towns?
- How would you describe the institutional relationship between the Environment Agency and East Lindsey Council in relation to:
    1) FIM
    2) Flood risk reduction (e.g. spatial planning issues)

- How does this relationship affect [town] in comparison with other districts in the County?
- Can you think of any particular examples of flood risk issues in the [town] area which have caused friction between East Lindsey Council and the Environment Agency?

5) Conclusions

- What, in your opinion, do you think could be done in order to increase the effectiveness of FIM in [town] or at the local scale in general?
- Is there anyone else that you feel it might be useful for me to talk to?

Appendix 4:

Summary of statistical results detailed in thesis

Correlated variables	Pearson Chi-square value	df	Asymp Signf	% cells with expected counts <5	Cramer's V
Town by LLTI	22.112	2	.000	0	.261
Town by Dependant child	25.077	2	.000	0	.274
Town by Access to vehicle	7.338	2	.026	0	.149
Town by Sea as flood source	18.275	2	.000	0	.235
Town by Flood likelihood	7.719	2	.021	0	.150
Town by "This community takes flooding seriously"	12.754	6	.047	0	.140
Town by respondent age (3 Group)	30.603	4	.000	11.1	.214
Gender by Flood Likelihood (All)	15.122	1	.000	0	.215
Gender by Flood Likelihood (Cleve)	7.446	2	.024	0	.254
Gender by Flood Likelihood (Morec)	8.651	2	.013	0	.305
Gender by Climate Change (CC) is making flooding worse	10.344	3	.016	0	.181
Trust (4 cat) by Reciprocity (4cat)	107.011	9	.000	0	.327
Trust (4 cat) by "People would help"	60.017	6	.000	0	.302
Informal Discussion by Civic Engagement	7.876	1	.005	0	.152
Flood Likely by Trust defences	23.00	1	.000	0	.338
Flood experience by Flood Likely	6.109	1	.013	0	-.134
Flood experience by Flood Likely (Mable only)	4.896	1	.027	0	-.203
Reciprocity (4 cat) by "People would help"	76.484	6	.000	0	.341
Social Support by Civic Engagement	18.163	1	.000	0	.230
* = Expected count of less than 5 in >20% of cells					
Town by Owner Occupation / Tenant	22.202	4	.000*	33.3	.183
Gender by CC is a real problem	8.265	3	.041*	25	.161
Age by CC taken seriously in [town]	20.333	6	.002*	25	.251
Age by Flooding taken seriously in [town]	30.390	6	.000*	25	.218

Correlated variables	Pearson Chi-square value	df	Asymp Signf	% cells with expected counts <5	Cramer's V
Age by Insurance (3 groups)	27.625	4	.000*	22.2	.207
Age by Flood Likelihood (Mable)	14.08	6	.029*	28.6	.345
Age by People would help during flood	24.289	6	.000*	25	.195
Age by Flood Warning	11.619	4	.020*	22.2	.133
Flood experience by Flood "3 things"	6.792	2	.034*	33.3	.141
Insurance by Housing circumstances	72.924	4	.000*	33.3	.338
Super Engaged by Formal Talk (Cleve)	3.387	1	.066*	25	.167
Super Engaged by Formal Talk (Morec)	8.859	1	.003*	50	.304
Super Engaged by Formal Talk (All)	9.419	2	.009*	50	.168
Super Active by Formal Talk (All)	21.206	2	.000*	50	.252
Super Citizen by Formal Talk (Mable)	6.314	2	.043*	66.7	.231
Super Citizen by Formal Talk (Morec)	20.907	1	.000*	25	.467
Super Citizen by Formal Talk (All)	13.480	2	.001*	50	.201
†= Close to significance					
Town by Insurance	8.822	4	.066†	0	.116
Gender by Flood Likelihood (Mable)	5.787	2	.055†	0	.221

Appendix 5:

Atlas ti© Causal Networks

5.1: Social Capital

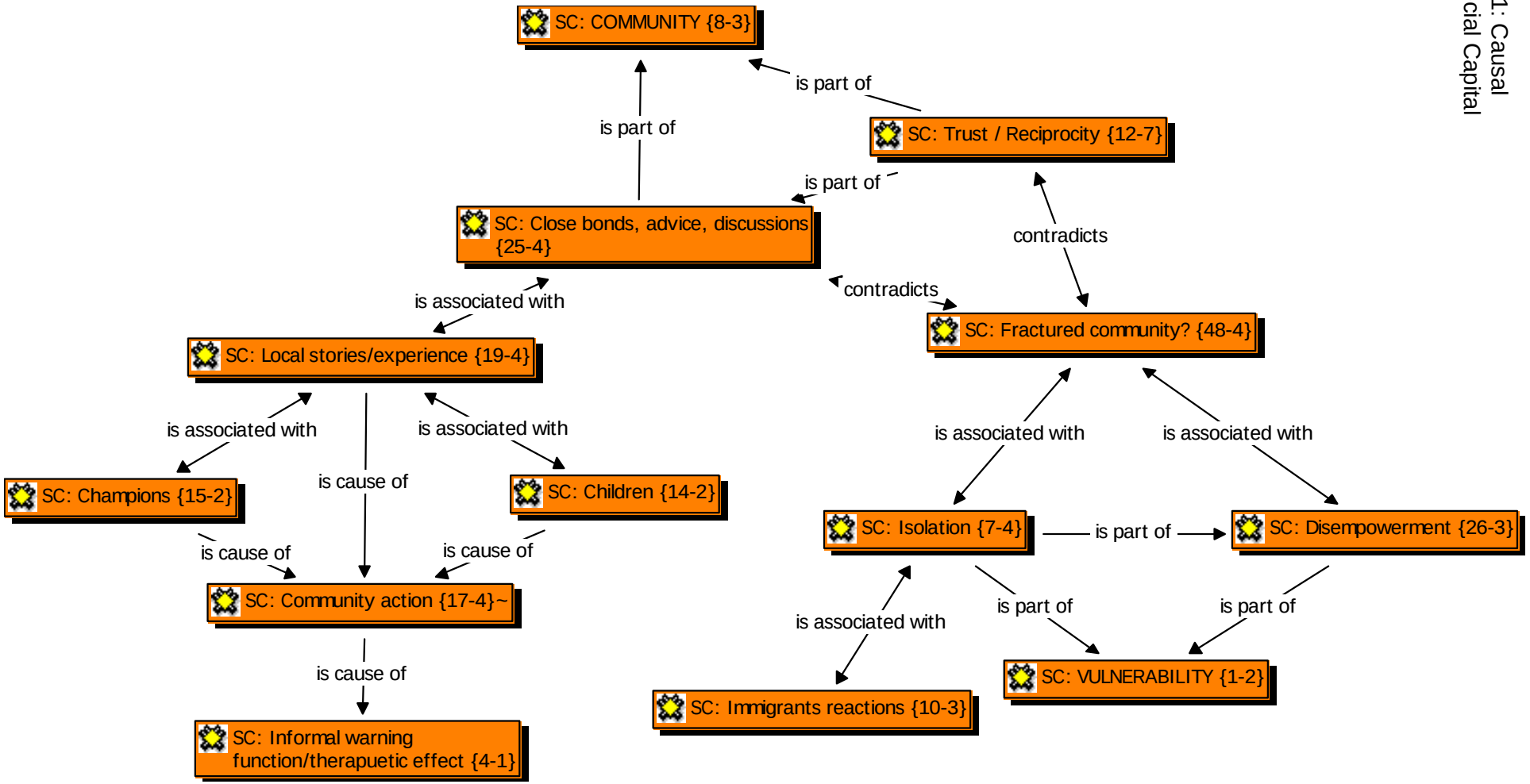
5.2: Warnings

5.3: Insurance

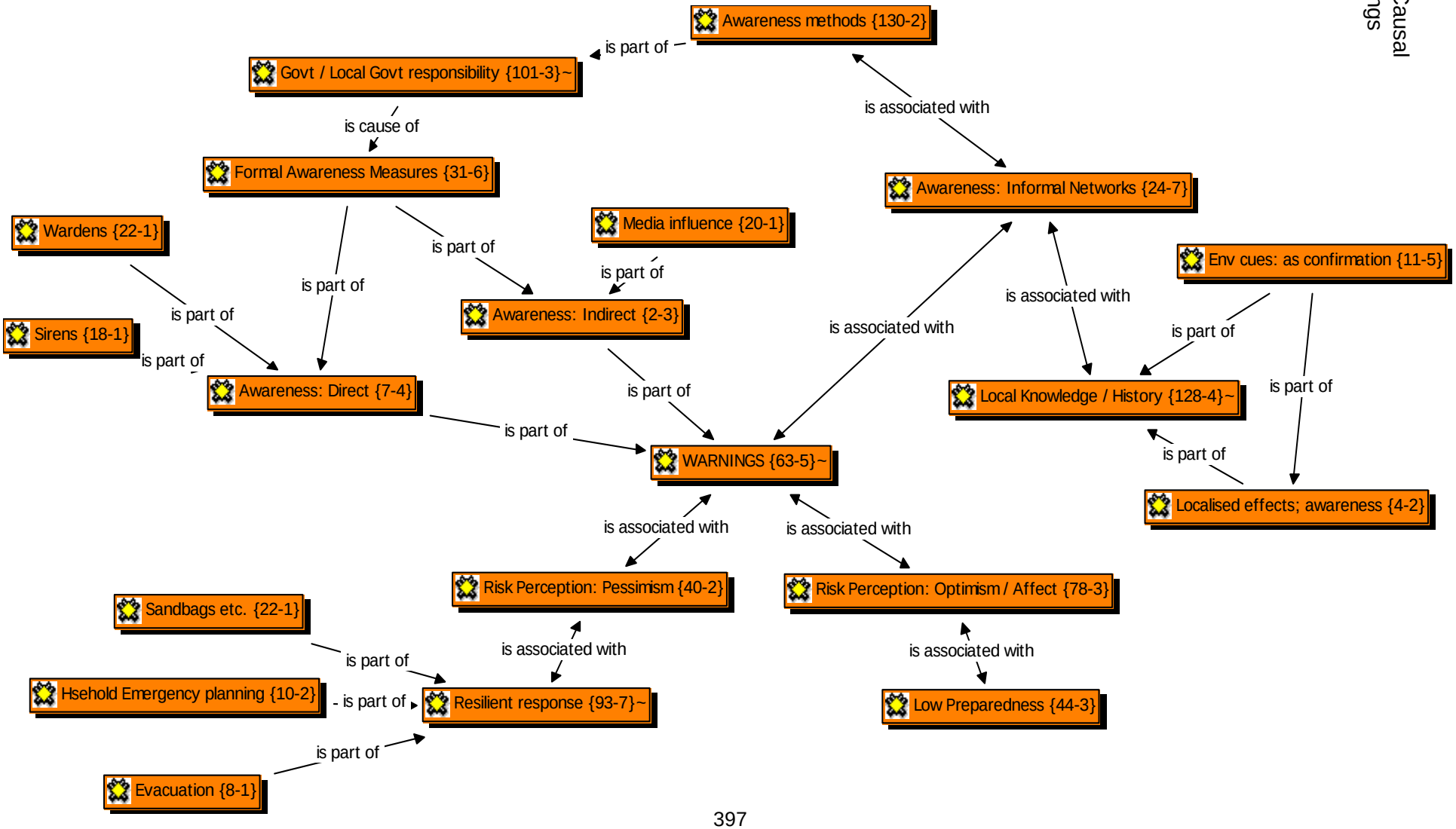
5.4: Environmental Cues

5.5: Drainage

5.6: Structural Defence

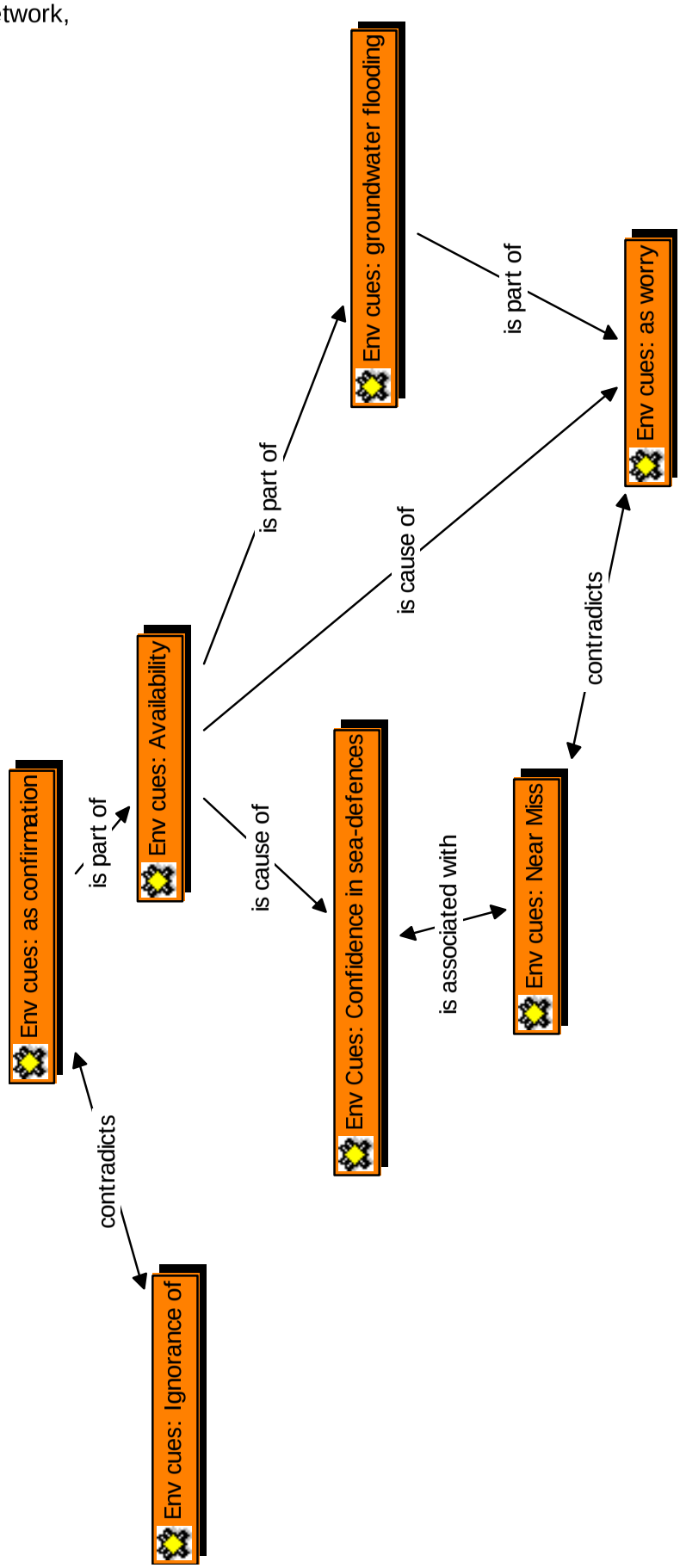

SC: COMMUNITY {8-3}
is part of
SC: Trust / Reciprocity {12-7}
is part of
is part of
SC: Close bonds, advice, discussions {25-4}
contradicts
contradicts
is associated with
SC: Fractured community? {48-4}
SC: Local stories/experience {19-4}
is associated with
is associated with
is associated with
is associated with
SC: Champions {15-2}
is cause of
SC: Children {14-2}
SC: Isolation {7-4}
is part of
SC: Disempowerment {26-3}
is cause of
is cause of
SC: Community action {17-4}~
is part of
is part of
is associated with
is cause of
SC: VULNERABILITY {1-2}
SC: Immigrants reactions {10-3}
SC: Informal warning function/therapuetic effect {4-1}

Appendix 5.2: Causal network, Warnings

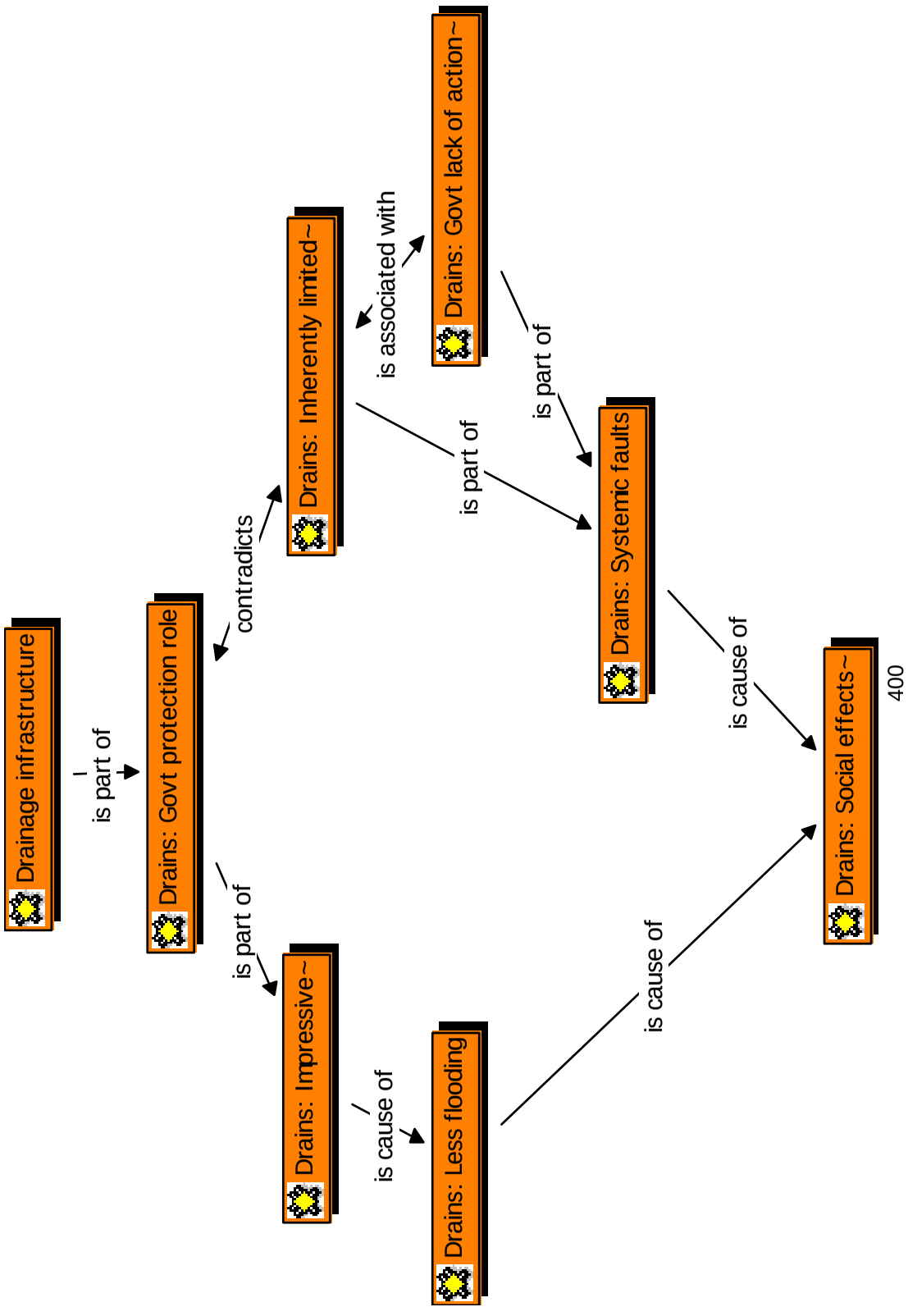


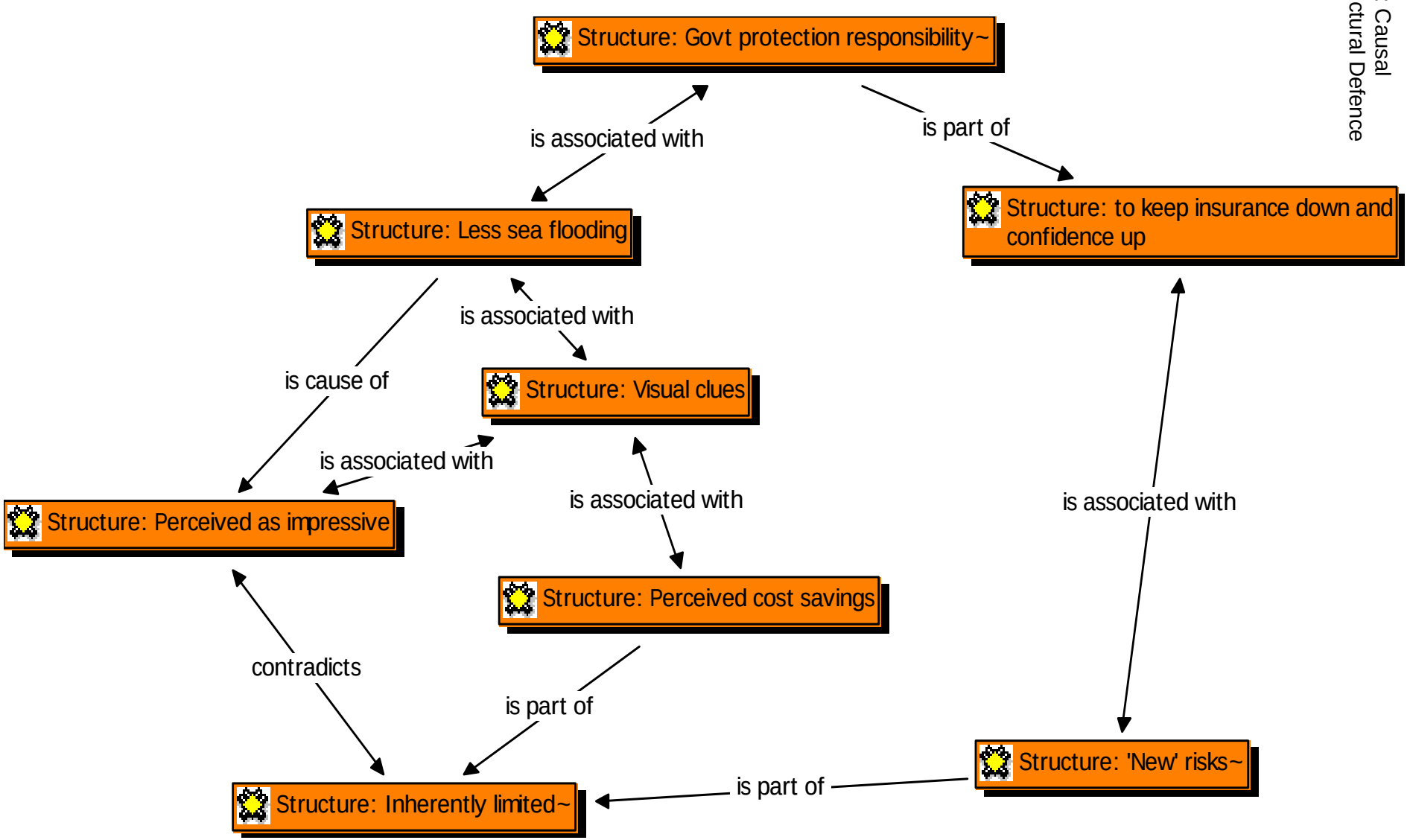
Appendix 5.3: Causal Network, Insurance

Appendix 5.4: Causal Network,
Environmental Cues



Appendix 5.5: Causal Network, Drainage




Structure: Govt protection responsibility~
is associated with
is part of
Structure: Less sea flooding
Structure: to keep insurance down and confidence up
is associated with
is cause of
Structure: Visual clues
is associated with
is associated with
is associated with
Structure: Perceived as impressive
Structure: Perceived cost savings
contradicts
is part of
Structure: 'New' risks~
is part of
Structure: Inherently limited~

Appendix 6: Focus Group Participants: age and social capital status

Mablethorpe:

Focus Group 1:	**Age Grp.**	'**Super' (see Section 6.5)**
• MbM1_01	65-74	Citizen
• MbM1_02	45-59	Citizen
• MbF1_03	(u/k)	[spouse of above]
• MbM1_04	60-64	Citizen
• MbF1_05	(u/k)	[spouse of above]
• MbM1_06	65-74	Supporter/Engaged
Focus Group 2:		
• MbF2_01	60-64	n/a
• MbM2_02	(u/k)	[spouse of above]
• MbM2_03	65-74	Supporter/Engaged
• MbM2_04	75+	Supporter
• MbM2_05	60-64	n/a

Cleveleys:

Focus Group 1:		
• ClM1_01	45-59	n/a
• ClM1_02	45-59	n/a
Focus Group 2:		
• ClM2_01	45-59	Supporter
• ClF2_02	65-74	Supporter
• ClF2_03	30-44	Supporter
• ClM2_04	45-59	Citizen

Morecambe:

Focus Group 1:		
• MrM1_01	30-44	Supporter/Active
• MrM1_02	30-44	Supporter
• MrF1_03	45-59	Supporter/Engaged
Focus Group 2:		
• MrF2_01	30-44	Citizen
• MrM2_02	65-74	n/a
• MrF2_03	18-24	Supporter/Engaged
• MrM2_04	45-59	Engaged

Appendix 7:

Environment Agency Flood Warning Codes

The EA flood warning system consists of the following codes, with the following meanings:

Flood Watch

What it means

Flooding of low lying land and roads is expected.

What to do

- Monitor local news and weather forecasts.
- Be aware of water levels near you.
- Be prepared to act on your flood plan.
- Check on the safety of pets and livestock.
- Charge your mobile phone

Flood Warning

What it means

Flooding of homes and businesses is expected. Act now!

What to do

- Move cars, pets, food, valuables and important documents to safety.
- Get flood protection equipment in place.
- Turn off gas, electricity and water supplies if safe to do so.
- Be prepared to evacuate your home.
- Protect yourself, your family and help others.
- Act on your flood plan.

Severe Flood Warning

What it means

Act now! Severe flooding is expected with extreme danger to life and property.

What to do

- Collect things you need for evacuation.
- Turn off gas, electricity and water supplies if safe to do so.
- Stay in a high place with a means of escape.
- Avoid electricity sources.
- Avoid walking or driving through flood water.
- In danger call 999 immediately.
- Listen to emergency services.
- Act on your flood plan.

All Clear

What it means

No further flooding is expected. Water levels will start to go down.

What to do

- Keep listening to weather reports.
- Only return to evacuated buildings if you are told it is safe.
- Beware sharp objects and pollution in flood water.
- If your property or belongings are damaged, contact your insurance company. Ask their advice before starting to clean up.

Source: E.A. (2007)